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CHEMICAL AGE

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INSECTICIDE RESISTANCE

RESISTANCE to the insecticides that formerly controlled them has developed by some 60 species of insects, ticks and mites. During the last 10 years the process has accelerated, concerns mainly DDT and other chlorinated hydrocarbons, and is most accentuated in houseflies and certain mosquitoes.

It has been recognised for some time that inherent in some individuals of an insect population there is the ability to withstand dosages of insecticides which normally kill the species. Introduction of selection by the insecticide results in the survival of these individuals which pass on this ability to their offspring. Continuing selection eventually results in the replacement of the original population by a population consisting entirely of resistant individuals. Where this occurs in populations of malaria-carrying anopheline mosquitoes, the end result is the continuation of transmission of the disease.

At the XVth International Congress of Zoology, held in London last week, there were several papers on insecticide resistance. Mr. G. Davidson at the Ross Institute of Tropical Hygiene, London School of Hygiene and Tropical Medicine has studied two different kinds of resistance in two different species of anopheline mosquitoes. One was a strain of *Anopheles gambiae* from Northern Nigeria, highly resistant to dieldrin (some 800 times in fact) and cross resistant to related compounds and BHC, but still susceptible to DDT. The second species studied was a strain of *Anopheles Sundaicus* (obtained from Java) resistant to DDT (some 40 times) but susceptible to dieldrin and BHC.

The studies indicate the existence of two different types of insecticide resistance in anopheline mosquitoes, both of which are monofactorially inherited: (1) Dieldrin-BHC resistance in which three phanotypes are recognisable; these mosquitoes remain susceptible to DDT; (2) DDT-resistance in which only two phanotypes are recognisable; these mosquitoes remain susceptible to dieldrin and BHC. In practice this means that a change of insecticide is all that is necessary to continue mosquito control where resistance appears. This has in fact already been done in Java and Saudi Arabia where DDT-resistant strains of *A. stephensi* recently predominated.

Davidson's work is important in that it also indicates practical means of detecting mosquito resistance in the field.

Information on basic problems of resistance can be gained from measurements of relative resistance to a range of different poisons (James R. Busvine, of London School of Hygiene and Tropical Medicine). Specific resistance and generalised vigour tolerance must be distinguished. In addition, the pattern or 'spectrum' of relative resistance which an insect shows to a group of related poisons might well be expected to characterise particular types of resistance. There are thus indications that a similar mechanism protects resistant strains of several different insects from the following group of poisons: gamma BHC, chlordane, dieldrin, aldrin, endrin, isodrin, toxaphene.

The phenomena of acquired tolerance of insects to chemicals have provided novel ways of studying two fundamental processes, reports Mr. F. P. W. Winteringham (Department of Scientific and Industrial Research, Slough). These are the evolution of biochemical mechanisms and the mechanisms of defence against toxic substances *in vivo*.

There is good evidence for the adaptation of enzymes under chemical stress and Winteringham states that it seems reasonable to suppose that the ability of an insect to respond to insecticidal pressure by detoxifying enzyme adaptation may be under genetic control and extreme enzyme adaptation might become genetically 'fixed.' Such a mechanism might explain the development of very high levels of resistance.

Another interesting feature is the remarkable high level of resistance attained by some insect strains, as, for instance, houseflies bred on a medium containing dieldrin, which are now immune to this insecticide. As dieldrin is a universal animal poison, this finding suggests greater biochemical or physiological differences between resistant and normal insect strains, than between different animal classes.

Winteringham has analysed the evidence of resistance of an insect to a chemical insecticide. The most important resistant mechanisms have been found to be due to the following factors: detoxification or excretion of the insecticide; abnormal biochemistry (e.g. reduced concentration of toxicating enzymes, change in enzyme-substrate affinity, alternative metabolic routes); and abnormal physiology (e.g. protective sheath round nerve axon, and enhanced lipid storage capacity.)

Investigation by Kearns and co-workers has left little doubt that the enzymic dehydrochlorination of DDT is the principal mechanism of resistance of *some* strains of housefly to DDT. Parathion resistance is due to failure of the absorbed parathion to undergo the essential toxication *in vivo* because injected paraoxon has been found almost as toxic to the resistant strain as to the susceptible one. As adult houseflies, highly resistant to dieldrin (I) have been bred by continuous exposure to dieldrin alone, and are also found to be highly resistant to the sulphur analogue (II) and to the δ-isomer of hexachloro*cyclo*hexane (III), a common resistance mechanism is indicated. It has been discovered that in the resistant insect compound (II) is dehydrohalogenated with the formation of the non-insecticidal pentachloro*cyclo*hexene, but there is no evidence of a corresponding detoxication of compound II (labelled with Sulphur-35). Winteringham concludes that this evidence agrees cogently that enzymic dehydrochlorination cannot be the common or principal defence mechanism. Attention has also been drawn to the structural similarity between compounds like I, II and III (pentagonal arrangement of chlorine atoms in the three-dimensional models). A change in the geometry of lipoprotein macromolecules of the cell membrane which might prevent access of these sterically related compounds to a common site of action and so account for the observed cross-resistance has been considered. Histologically, differences in the lipoprotein structure between the epicuticles of normal and DDT-resistant houseflies have been demonstrated.

In practice, a change of insecticide is all that is usually necessary to continue insect control where resistance appears. On theoretical grounds, a solution to the resistance problem is to find compounds which are more toxic to those insects resistant to the present insecticides, i.e. where the cross resistance pattern of the new compound is negatively correlated with that of the existing insecticide and this negative correlation derives from the pleiotropic action of a single gene. There is some evidence, reports A. W. A. Brown, University of Western Ontario, Canada, that cetyl bromoacetate shows this property for resistant houseflies; and an organo phosphorus preparation (based on diisopropyl tetrachloroethylphosphate) has been capable of selecting out the DDT-resistant flies and restoring the strain to DDT-susceptibility.

RE-KNOTTING THE NOOSE

WHETHER the statement of Labour's policy for Britain's economic expansion published last week-end under the optimistic title of 'Plan for Progress'—which will no doubt meet with acceptance at the annual conference of the Party in the autumn—will ever become Government policy it will be for the electorate to decide. As an instrument of dynamic persuasion of the British voting public it is an uninspiring document, promising little more than 'beginning again where we left off last time', first by the re-nationalisation of steel and road haulage. As a medium for the slow suffocation of private enterprise, however, it is productive of quite a crop of new devices.

Broadly it envisages the same old strait-jacket of State regimentation plus an intensified probing into the affairs of large, medium and, to a lesser degree, small-sized businesses to secure conformity with Labour's yardstick of dictated national objectives and needs. The Socialist politicians still believe they know better than directors how to run industry. The curious thing is that added to this delusion is the further one that private enterprise welcomes it! 'There is little reason to doubt,' states the document, 'that the return to power of a Labour Government pursuing policies of expansion and full employment will in itself do much to create an expansionist mood in British industry.'

There is a flesh-creeping desire also to inoculate private industry with the dazzling proficiency which has marked the direction of the nationalised industries in the creation of which the basic aims of the Labour Government were 'to make them model employers, to create real opportunities for advancement in industry, to raise the status of working people and to give them a chance to participate in the control of their industries.' Extension of these powerful contributions to the 'overall efficiency of industry', so admirably displayed in the accomplishments of the National Coal Board and the British Transport Commission for example, should be encouraged, urges 'Plan for Progress', in the private sector.

So the nationalised industries are to provide the models for industrial behaviour and private enterprise is to be on probation reporting regularly to the Government on what it is doing, what it hopes to do and how it intends to go about it. 'Plan for Progress' is based on the prejudiced premise that private enterprise is the nigger in the economic woodpile. It proffers the old familiar frustrations and the reinstatement of the dogmas which have been tried and found wanting.

SIMPLIFIED PROCESS FOR MELAMINE

A NEW French process for making melamine, developed by Société des Produits Azotes (France) appears to simplify production and to give a better product.

Details of the process (published in Australian Patent No. 33,026/57) indicate calcium cyanamide is reacted to dicyandiamide, and is then polymerised to melamine (the same as the classical approach). However, after the solid dicyandiamide is heated to over 100°C, it is reacted with gaseous ammonia under pressure. The pressure of the ammonia is maintained throughout the reaction and through the cooling of the reaction product until the temperature falls to 250°C. Such is the pressure of the ammonia that it is at least 50 kg./sq. cm. at the end of the reaction.

Noteworthy is the renewal of interest in cyanamide as a starting material. For some time efforts have been made to produce melamine from other raw materials and in particular from urea. Certainly the new process appears to be arousing interest in the US where it is being studied.

NOTTINGHAM HIGH POLYMER CONFERENCE

Sponsored by IUPAC, Papers are Given by World's Leading Scientists

UNDER the auspices of the Macromolecular Commission of the International Union of Pure and Applied Chemistry, a conference on high polymers was held at Nottingham University from 21 to 24 July. This International High Polymer Conference was organised by a British committee under the chairmanship of Sir Harry Melville, secretary of the Department of Scientific and Industrial Research.

The conference provided a timely opportunity for a full exchange of views between all those working in the high polymer field, whether at universities, industrial or Government research establishments.

Two main themes were selected for the conference for their particular interest both to academic and industrial scientists. In Section A—Reaction mechanisms and kinetics—heterogeneous polymerisation, including trapped or inactive radicals was considered as well as production of graft and block copolymers. In Section B—Physical, thermodynamic and mechanical properties were considered. In the general sessions the following papers were delivered: G. Natta, 'Kinetic studies on heterogeneous catalysis in the α-β-olefin stereospecific polymerisation; A. Gilchrist, 'Kinetic studies on a Ziegler polymerisation reaction; A. Orzechowski, 'A study of the formation and performance of aluminium triisobutyl-$TiCl_4$, Ziegler catalyst in ethylene polymerisation; C. E. H. Bawn, 'Polyhydrocarbons from diazo compounds'; O. F. Soloman and R. Mihail, 'Polymer isotactic isomer'; C. G. Overberger, 'Some aspects of the termination reaction in heterogeneous ionic polymerisation'; V. A. Kargin and associates, 'High polymers obtained using organometallic complexes containing lithium and titanium' and 'The problem of chromium monoxide catalysts: applications associated with the preparation of stereo regular α-polyolefins'; C. E. H. Bawn, 'Polymerisation of ethylene by soluble Zeigler catalysts'; C. C. Price, 'Isotactic polyethers and related polymers'; G. Gee, 'Polymerisation of olefine oxides'; C. H. Bamford, 'Trapped radicals in heterogeneous polymerisation'; D. H. Whiffen, 'Electron spin resonance spectra of radicals trapped in polymers'; F. S. Dainton, 'Polymerisation of acrylonitrile in aqueous solution'; S. H. Pinner, 'Heterophase radiation polymerisation'; S. R. Palit, 'Some observations on the effect of the physical nature of the separating phase on the rate of heterogeneous polymerisation'; and R. J. Parsons and H. Warson, 'Heterogeneous copolymerisation of methacrylate esters with methacrylate ion in aqueous media'.

The full papers will be published by Interscience Publishers Inc., US.

Polymerisation of Ethylene by Soluble Ziegler Catalysts

THERE WAS evidence that soluble complexes formed by interaction of certain titanium compounds and metal alkyls polymerised ethylene in solution at normal temperatures and pressures but at a rate much lower than that of typical heterogeneous Ziegler catalysts. In anticipation that kinetic studies in the homogeneous phase might be more amenable to interpretation, Professor C. E. H. Bawn and R. Symcox (Department of Inorganic and Physical Chemistry, University of Liverpool) have studied polymerisation of ethylene using a soluble catalyst formed by the reduction of *sec*-butyl titanate with aluminium triethyl.

Kinetic measurements have shown that the rate of polymerisation, using the most effective catalyst composition, was proportional to the ethylene pressure up to a limiting pressure above which the rate became independent of pressure. In the latter region, these investigators considered that the rate was controlled by the rate of dissolution of the ethylene. The falling-off in rate of polymerisation noted as the reaction proceeded indicated loss of activity of the catalyst and this had to arise, it was believed, either from thermal instability of the active intermediate or by its reaction with the products of the polymerisation.

The active catalyst in the polymerisation was a product of the reaction between aluminium triethyl and the titanate. The catalyst solution produced was dark in colour but had no precipitate. It is suggested that some change in catalyst occurred as indicated by a study of the gas evolution which occurred during catalyst formation (a slow evolution of ethane over several days), and that this probably arose by reduction of the titanate complex beyond its value of maximum activity.

The maximum activity might be explained if the catalyst was formed by interaction and reduction of the titanate by the aluminium alkyl. At small ratios of Al:Ti (maximum in activity at the ratio Al:Ti=3:1) the alkyl concentration was insufficient to give the most active complex, while in the presence of excess alkyl the reduction proceeded too far and gave a reduced form of lower activity. Total inhibition of the reaction by alkyl halides, alcohols, and other polar molecules was due to reaction and destruction of the active complex, it was stated.

Bawn and Symcox reported that one aspect of the reaction which was difficult to understand was the well-defined 'cut-off' pressure of ethylene below which no polymerisation occurred. This limiting pressure increased with increase in total catalyst. The results indicated that the catalyst was also complexed with the ethylene.

'It was reported that preliminary results with Grignand reagents instead of with $AlEt_3$ and *sec*-butyl titanate showed that while the catalyst formed was of lower efficiency, solid high molecular weight polythene' was formed. This marked decrease in catalyst activity compared with the aluminium alkyls supported the view that the latter was part of the catalyst complex.

Kinetic Studies on Ziegler Catalyst Systems

MEASUREMENTS have been made on the kinetics of the polymerisation of ethylene using Ziegler-type catalysts made from zinc di-*n*-butyl and titanium tetrachloride in hydrocarbon solvents.

In his contribution, '*Kinetic studies on a Ziegler catalyst system,*' A. Gilchrist (Imperial Chemical Industries Ltd., Winnington, Northwich, Cheshire, England), describes some results obtained in 1955 and 1956. The particular catalyst system chosen for study was that containing zinc di-*n*-butyl and titanium chloride, with ethylene monomer.

The rate of polymerisation was proportional to the square of the ethylene pressure. At catalyst ratios (the molar ratio of zinc butyl to titanium tetrachloride in the reaction mixture) less than 0.5, an initial, fast polymerisation was followed by a slower but more persistent polymerisation. Both processes increased in velocity with increasing ratio up to 0.5; above this ratio the fast process was not observed while the rate of the slower one decreased with increasing ratio and was very small at unit ratio. At higher ratios the rate increased again as though to reach a limiting value when a very large excess of zinc butyl was used. It has not been possible to devise more than speculative interpretations of these results. They suggest that at ratios greater than unity the reaction $TiCl_4 + ZnBu_2 \longrightarrow TiCl_2 + ZnBuCl + (Bu$ radicals) —— other products may be completed and that the chain initiation step takes place between zinc butyl and ethylene, both adsorbed equilibrium-wise onto the solid, reduced titanium chloride. It is not yet known whether propagation of polymerisation occurs along the catalyst surface or at single sites on the surface. If the former is the case and the mobile propagation centre is an ion-pair, the hydrocarbon end being negative and the positive charge lying on the surface, the mobility of this latter charge may limit the rate of propagation.

FORMATION AND PERFORMANCE OF ZIEGLER CATALYST

PURPOSE of the paper by A. Orzechowski (New Products Research Department, Godfrey L. Cabot Inc., Cambridge, Massachusetts), on a *'Study of the formation and performance of triisobutylaluminum —$TiCl_4$, Ziegler catalyst, in ethylene polymerisation'* was to provide information on the preparation of catalysts that are both highly active and reproducible. Some data on the influence of certain variables on catalyst performances in a system of controlled purity were also presented.

Polymerisations were run at atmospheric pressure, with catalyst formed *in situ*, and with reaction rate unrestricted by gas-liquid mass transfer rate. The influence of impurities on the catalyst performance has been minimised by a concerted effort to eliminate moisture, oxygen, etc., from the system as a whole; by the use of triisobutylaluminum scrubbers to purify the ethylene; and through the purification of the solvent, isooctane, by distillation in presence of triisobutylaluminum. Conditions leading to reproducible results and high catalyst efficiency have been established.

A catalyst prepared in the absence of ethylene is relatively inefficient depending on Al/Ti ratio. Under the conditions studied, the most efficient catalysts were obtained by the addition of triisobutylaluminum to the $TiCl_4$. The reverse mode of addition gave poor catalysts, particularly if the triisobutylaluminum was exposed to ethylene for a short time at 50°C. However under special conditions insuring complete mixing before significant reaction or aging of the catalyst components, the order of addition had no effect.

Maximum Efficiencies

A study of the performance of catalyst prepared by the rapid addition of triisobutylaluminum to $TiCl_4$, as a function of its components concentrations, at 50°C., revealed regions of maximum efficiencies. Maximum efficiency of 600 to 850 g. polythene/g. triisobutylaluminum was reached with Al/Ti ratios between 1.4 and 2.8. The efficiency with respect to $TiCl_4$ reached a plateau of 1800 g. polythene/g. $TiCl_4$ above an Al/Ti ratio of 2.8. The ratio of polymer yield to maximum polymerisation rate was constant above an Al/Ti ratio of 1.4. The highest efficiency, 1500 g. polythene/g. triisobutylaluminum and 2100 g. polythene/g. $TiCl_4$, was obtained by incremental addition of triisobutylaluminum. These results have been interpreted consistently with a previously proposed mechanism of heterogeneous catalysis of polymerisation.

It appears that under conditions of rapid triisobutylaluminum addition, all intrinsic properties of the catalyst become constant above an Al/Ti ratio of 2.8. That is, the surface of the solid phase (presumably $TiCl_3$) is apparently a constant molar fraction of the total titanium content and is completely covered by adsorbed triisobutylaluminum. The same effect can be obtained at a lower Al/Ti ratio of about 1.4 when triisobutylaluminum is added incrementally. Otherwise, at Al/Ti ratios below 2.8, the adsorbed co-catalyst is partly alkylaluminum chlorides, resulting in decreased activity per polymerisation centre. At a ratio of 0.7 the surface is less than completely covered with adsorbed aluminum compounds. It is indicated that the polythene obtained at high Al/Ti ratios is partially crosslinked. The physical nature of the polymer varies with operating conditions.

A new, simple method for determining the quantity of catalyst poisons in the solvent was described. To determine catalyst poisoning, the impure solvent is titrated by adding increments of Reagent I (0.12 M solution of triisobutylaluminum in isooctane), each increment being followed by a drop of Reagent II (0.3 M solution of $TiCl_4$ in isooctane). The end point is shown by the appearance of a faint yellow colour. The total consumption of AlR_3 is taken as a measure of the content of harmful impurities. A second titration provides a more accurate determination of impurities.

Impurity content is expressed as moles x 10^5 of triisobutylaluminum per 100 ml. of isooctane.

This method is stated to lend itself to other analytical applications. Thus, the supernatent solvent obtained after filtration or centrifuging of Ziegler catalyst may be analysed for its content of excess free AlR_3, or excess free $TiCl_4$. Free AlR_3 can be determined quantitatively by using a solution containing unknown amounts of free AlR_3 in lieu of Reagent I, and titrating a solvent containing known amounts of impurities with it. Free $TiCl_4$ can be detected qualitatively by addition of free AlR_3. In both cases, the colour developed by the interaction of the two compounds is used as an extremely sensitive indicator.

High Polymers from Organometallic Complexes of Lithium and Titanium

PROCEDURES have been worked out by K. A. Kocheshkov, V. A. Kargin, O. A. Paleev, T. V. Talalajeva and T. I. Sogolova (Akadcmija Nauk SSSR, Leninskiy Prospekt 14, Moscow) by which a wide range of aliphatic and aromatic organolithium compounds can be obtained in a crystalline state that enables a particular compound to be made in a predetermined quantity.

With different organolithium compounds of the aliphatic and aromatic series thus at their disposal, Kocheshkov *et al* have been able to establish, tentatively, some relationships between the value of the radical attached to lithium and the properties of the polymers produced with these catalysts.

Ethyllithium was prepared from ethyl chloride and lithium (after recrystallisation from hexane mp. 95°C); butyllithium was produced directly in the hexane form *n*-butyl chloride by conventional means; *n*-dodecylithium was obtained from *n*-dodecyl chloride and lithium in hexane; benzyllithium was produced as described by Ziegler (Belg. Pat. 543,913).

Aromatic organolithium compounds were obtained by an exchange reaction between appropriate aryl bromides and ethyllithium. These crystalline lithium aryls contain 8 to 10 per cent lithium bromide and the ratio of RLi to $TiCl_4$ was in all cases 1:1.

Investigation of various organolithium compounds has led these workers to conclude that the products of their reaction with titanium tetrachloride differs in catalytic activity, making it impossible to carry out the polymerisation of ethylene at temperatures ranging from —75° to 55°C. The polymers produced have been of very similar molecular weight, involve almost the same number of methyl groups, but differ in their mechanical properties.

Kocheshkov *et al.* suggested, therefore, that at present the differences in mechanical properties were due to peculiarities of the polymer structure which, in turn, depended to some extent on the nature of the catalyst and on that of the radical. They indicated that further study of the nature of the catalyst should throw some light on this dependence.

Heterophase Radiation Polymerisation of Isobutene and Methyl Methacrylate

AS THE view was held that initiating entities in radiation-induced polymerisation reactions were exclusively free radicals, a programme was initiated to detect the presence of ions capable of participation in chain propagation reactions. This programme has been conducted by R. Worrall and S. H. Pinner (Tube Investments Research Laboratories, Saffron Walden, Essex).

Isobutene at —78.5°C proved to be a suitable model compound for demonstrating an ionic propagation reaction. Exposed to gamma rays or to fast electrons, a high molecular weight rubbery polymer was found indistinguishable by infra-red examination from that normally obtained by chemical initiation.

The rate of polymerisation of isobutene, induced at low temperatures by high energy radiation, was considerably increased when the reaction was carried out in the presence of certain inorganic compounds, notably metal oxides (ZnO etc.) of high surface area. It was stated that the acceleration was not accompan-

ied by a corresponding increase in the molecular weight of the polymer.

The rate of polymerisation of methyl methacrylate when exposed at room temperature to electrons at high intensity was increased by the presence of polythene powder. A consideration of the mechanisms of acceleration under heterogeneous conditions led these investigators to believe that the increase in rate in the first case was due to an increase in the rate of initiation and in the second case to a decrease in the bimolecular termination rate constant.

Polymerising Methacrylonitrile with Lithium in Ammonia

In an attempt to elucidate the mechanism of initiation in the lithium-ammonia-methacrylonitrile system, studies have been made by C. G. Overberger, Eli M. Pearce and N. Mayes (Department of Chemistry, Polymer Research Institute, Polytechnic Institute of Brooklyn, New York) on the dependence of the average degree of polymerisation on catalyst and monomer concentrations.

The molecular weight of polymethacrylonitrile obtained in the system lithium-ammonia-methacrylonitrile at —75° increased with decreasing concentrations of lithium and increasing concentrations of methacrylonitrile, and in addition was found to be proportional to (methacrylonitrile)/(lithium). On the basis of this and additional evidence a one-electron transfer from lithium to methacrylonitrile to give an anion radical has been postulated.

The polymethacrylonitrile obtained in this work was coloured yellow to orange and was sparingly soluble in acetone. Anionic-initiated polymethacrylonitrile has been shown to give a characteristic absorption in the infra-red spectra at 1,667 cm.$^{-1}$ (Beaman, *J. Am. Chem. Soc.*, 1948, **70**, 3115) whereas a heated copolymer of methacrylonitrile and methacrylic acid, in addition to becoming less soluble in acetone with little change in the molecular weight, showed new absorption frequencies at 1,693–1,490 cm.$^{-1}$ (Grassie and McNeill, *Polymer Sci.*, 1958, **27**, 207) and base-treated polyacrylonitrile at 1,665 cm.$^{-1}$ (La Combe, *ibid.*, 1957, **24**, 152). The last two sets of workers related these absorption frequencies to conjugated —C=N—.

Overberger and his co-workers, therefore, believe that the presence of the absorption at 1,675 cm.$^{-1}$ found in their polymethacrylonitrile was possibly indicative of the presence of $(—C=N—)_x$. Its presence could be accounted for by a mechanism similar to that proposed by Grassie and McNeill for the reaction which occurred upon heating a methacrylonitrile-methacrylic acid copolymer. Only a small percentage of such a reaction probably occurred in Overberger *et al.*'s studies, but that it was sufficient to give colour to the polymer.

Applying Metal Oxide Catalysts to Obtain Crystalline Polyolefins

THE need for the requisite experimental facts regarding the mechanism of the action of heterogeneous catalysts based on metal oxides of variable valence for obtaining high-molecular polyolefins was stressed by A. V. Topchiev, B. A. Krentsel, A. I. Perelman and K. G. Miesserov (Academija Nauk USSR, Leninskiy Prospect 14, Moscow). These workers have therefore made a comprehensive experimental study of the nature of the catalytic activity of the oxide catalysts in polymerisation reactions and a study of the mechanism of the process, and in their paper 'On the question of applying chromium oxide or molybdenum oxide catalysts to obtain crystalline poly-α-olefins', the particular poly-α-olefin being polythene, they present certain experimental observations.

Chromium oxide catalyst was obtained by shaking synthetic aluminium silicate with chromium anhydride. The catalyst was subjected to activation at 500°C in a current of air. According to a thermographic analysis intereaction between CrO_3 and Al_2O_3 occurred between 108° and 110°C. Activity of the catalyst was stated to depend on the degree of dehydration of the aluminium silicate.

The presence of sexivalent chromium in the catalyst was stated to be a necessary condition of its activity (optimum relation between Cr^{vi} and Cr^{i} should be 3:2). Too high a temperature led to deactivation of the catalyst by virtue of a decline in Cr^{vi}. Cr^{vi} content would also be low if there was an insufficient supply of air. Under the action of hydrocarbons (in particular, benzene) the catalyst lost its activity, being completely reduced to Cr^{iii} with the evolution of active oxygen. Ordinary oxidation techniques, however, easily regenerate the catalyst

It was reported that results obtained from an experimental study of the production of polythene on a molybdenum oxide catalyst led to the belief that polymerisation of ethylene on molybdenum oxide catalyst developed according to the radical chain mechanism.

The experiments with an aluminium-molybdenum catalyst established that rate of formation of the polymer and its properties were determined not only by the conditions of the process (temperature, pressure, solvent) but also by the relation between the oxides of the tetra— and sexivalent molybdenum. This catalyst was used to obtain polythene with a melting temperature up to 215°C and a molecular weight from 10,000 to 5,000,000.

Polymerisation of Acrylonitrile in Aqueous Solution

THE kinetics of polymerisation of acrylonitrile in aqueous solution when initiated (a) by Fenton's reagent and (b) photochemically using various photosensitisers have been determined dilatometrically over a wide range of conditions by Professor F. S. Dainton and (in part) P. H. Seaman, D. G. L. James and R. S. Eaton (Department of Physical Chemistry, The University, Leeds 2).

Whenever ferric salts were either present initially or generated *in situ*, some polyacrylonitrile radicals ($S^{\times}$) were always destroyed by the reaction:

$$S + Fe(III) \longrightarrow p_j + Fe(II)$$

for which $k = 6.7 \times 10^{-5} \exp(-2.3 \text{ kcal./}RT)$ 1. mole^{-1} sec.$^{-1}$. Reaction (1) might be suppressed by addition of fluoride ion. When Fe_3+OH^{-5} was used as the photosensitiser for 3130 A. light, the intensity exponent x was given by $1 > x > 0.5$, being larger the greater [Fe(III)]. This effect was also due to reaction (1) competing with mutual termination, and measurements of $d[Fe(II)]/dt$ confirmed this and led to values of the primary quantum yield in agreement with published values. The rotating sector technique could be applied and gave $k_p = 3 \times 10^{7} \exp(-4.1 \text{ kcal./}RT)$ and $k_t = 3 \times 10.^{13} \exp(-5.4 \text{ kcal./}RT)$ 1. mole^{-1} sec.$^{-1}$ From observations of the small photo after-effect, the 'build up' to the steady state in both (a) and (b) above, and the effect of mechanical agitation on all these phases of the reaction, it was concluded that some of the observed rate is due to polymerisation of radicals buried in polymer particles, P* (one radical per particle) utilising adsorbed monomer. In mechanically undisturbed systems, P* particles were constant in number throughout the steady state, decayed slowly and bimolecularly during the after-effect, but were not oxidised by Fe(III). The presence of these particles was responsible for the changing order with respect to (m_1) from two to unity as (m_1) was increased. The value of $(m_1)_c$, the concentration at which this change of order takes place, was dependent on the rate of initiation and air temperature in a way which reconciled previously published conflicting rate equations.

A selection of other interesting papers presented at the conference will be summarised in our next issue.

New BP Unit Commissioned

British Petroleum Co.'s alkylation unit at the company's Kent Refinery has just been commissioned. It is part of the company's £30 million expansion project at the refinery.

The alkylation process was pioneered by BP and plays an essential part in the manufacture of high grade aviation gasoline. When other equipment in the 'avgas' range of plant is commissioned in the next two or three weeks, high grade aviation gasoline will be produced at Kent Refinery for the first time. Some 130,000 tons of high grade aviation gasoline will be produced a year. Annual throughput of the refinery is now more than 7 million tons of crude oil.

A 'PEACE TREATY' has been signed between rival sponsors of chemical means of putting durable creases in woollen fabrics.

Marks and Spencer, who are backing the process developed by Professor J. B. Speakman, of Leeds University, and the Commonwealth Scientific and Industrial Research Organisation, promoters of the Australian SI-RO-SET system, have formally agreed not to oppose each other's patent applications or commercial activities.

Both processes are based on the well-known 'permanent waving' qualities of thioglycollic acid derivatives, and it is feasible that if these sponsors opposed each other's patent applications by lodging objections on the grounds of similarity, even if only in some respects, neither might succeed in achieving official protection.

Obviously any effective means of putting permanent creases into woollen fabric is as of high commercial significance, particularly in view of the lead taken by man-made fibres in the market for women's skirts and men's suits in which creases and pleats will withstand the rigours of wear, weather and cleaning processes.

FLAGELLATION, self-humiliation and the British genius for self-abasement. These add up to the practically unceasing denigration of British salesmanship, British labour and British achievement by the British themselves. This highly critical view of Britain's successful efforts to undersell herself was taken by Sir Miles Thomas, Monsanto Chemicals chairman, and Sir Frederic Hooper, managing director of Schweppes, in a recent four-cornered discussion at Monsanto House.

Others taking part were Miss Mary Goldring, science correspondent of *The Economist* and Mr. Norman Crump, city editor of *The Sunday Times*. The answer to the theme 'If Great Britain were a commercial undertaking, would you invest in it?' was a resounding and unanimous 'Yes.'

Crump called for a new feeling, to get away from the self-abasement; he saw this as one of the big and immediate jobs. Sir Miles added: 'Let John Bull stick his chest out.' As stated before in this column, I am entirely with Sir Miles on this. To me the British chemical industry is a good example of the underselling that goes on all the time in the UK. For too long it has suffered from an inferiority complex; afraid to boast of its many and great achievements. Too often, UK chemical firms announce spectacular advances in a whisper when they should be shouting from the rooftops.

I for one hope Sir Miles can use his influence and wealth of publicity experience to persuade the chemical industry, of which he is a leading figure, to adopt a more aggressive policy. Perhaps Monsanto Chemicals will take the lead and show other firms how it should be done.

Incidentally, this Monsanto House discussion is reported in the first issue of *Monsanto Mail*, a bright and stimulating new magazine that will be circulated mainly outside the company. In a foreword Sir Miles says 'To-day more than ever there is a need to write of science in human terms without the encumbrance of jargon. This, in our own way, we hope to do.'

MY STUDY of various forms of literature covers a prolific number of books, journals, magazines, etc. Pursued with the hope of broadening my knowledge, it is often rewarded by interesting tit-bits that add spice to the search.

This week, for instance, when hastily scanning the pages of the July *ICI Magazine* I discovered that a new proficiency badge which a Boy Scout can earn in Canada is that of a chemist. Details apparently were worked out with members of the Chemical Institute of Canada.

To earn his badge, a Scout must satisfy a number of requirements which supplement chemistry learned at school. Methods of water purification, demonstration of natural chemical processes observed outdoors and the working of fire extinguishers are a few of these. I wonder how long it will be before some enterprising member of the 250th North New Brunswick Troop discovers the possibilities of sodium nitrate, potassium chlorate etc.—and the preparation of stink bombs.

THE FIRST piece of potash ever mined in Canada was brought to the surface recently at a site 15 miles east of Saskatoon. The potash represents the culmination of a $20 million investment, years of exploration, two years of shaft sinking and the building of a surface plant by American Potash of New Mexico. Mr. R. G. Haworth, company vice-president, said that 'he reserve of good potash ore in New Mexico is running out, and the new development could carry on until Saskatchewan assumed the dominant position in the potash industry.

Saskatchewan Premier T. C. Douglas, stressing the importance of potash to his province, said that it would be mined long after the oil pumps had ceased to function. The potash deposit is believed to underly the entire strip of country between Esterhazy in the east of Saskatchewan and Unity, on the western fringes.

Another potash development has been started by International Minerals and Chemicals Corp., in the Esterhazy area. Two or three European firms are also known to be interested in other leases near Esterhazy. The potash salt bed is about 300 ft. thick in the Saskatchewan area, and contains several layers of seams of potash. It is said to be of slightly better quality than the best found in New Mexico. Some work remains to be done at the bottom of the 3,200 ft. shaft before the start of production, scheduled at 4,000 tons of ore daily and 500,000 tons a year.

UNDER the heading 'super-saturated gas solutions,' the report of the Sondes Place Research Institute (see CA, 19 July, p. 105), referred to a fundamental study of the stability of super-saturated solutions of carbon dioxide in aqueous media. Ultimate objective of this seemingly 'dry' subject, undertaken for Arthur Guinness Son and Co., Park Royal, is to control 'gushing' in bottled beers, a subject of considerable interest to most chemists.

The phenomenon is comparatively rare and earlier work in different parts of the world has yielded very conflicting evidence as to its cause. It is believed that a better understanding of factors affecting the stability of simple super-saturated gas solutions is necessary before a scientific approach can be made to controlling gushing in bottled beer. Gushing has much in common with 'bumping' in super-heated liquids. Release of gas or vapour bubbles is profoundly affected by the presence or absence of suitable nuclei. The problem is being studied at Sondes Place in the light of the surface energy relations at the gas-solid-liquid interface around particles of colloidal or near-colloidal solids.

SCOTTISH research workers deserve top marks for a unique scheme of co-operation which in two years has established itself as a feature of industry in Scotland. Known as MAS (Mutual Assistance Scheme of Scottish research laboratories), it provides for the exchange of information on special problems, unbiased opinions on the value of items of special and costly equipment; an exchange and mart scheme; free loan of equipment.

The scheme is a link between laboratories engaged in research of an industrial, medical and agricultural nature. It embraces universities, Government departments, nationalised industries, technical colleges, research associations and private firms. The aim is to pool knowledge and, where practicable, make equipment available in a spirit of mutual help.

MAS is the brainchild of Mr. E. Martindale, DSIR liaison officer in Scotland. He was concerned that a wealth of information was going to waste in laboratories because of the lack of any systematic attempt to marshal it and channel it to places where it could be used.

Alembic

SOVIET WORKER CLAIMS BIG ADVANCES IN SILICATE OUTPUT

DEVELOPMENT of the Soviet silicate industry has been discussed recently in the Russian journal, *Chemical Science and Industry* (V. E. Shneider, *Khim. Nauka i Prom.*, 1958, **3**, 109).

In the table reproduced below Shneider first shows the rapid increase in output of cement, glass, ceramics, etc., in recent years:—

Type of material	Unit	1913	1928	1940	1955	1956
Cement	Tons.106	1.8	1.85	5.7	22.5	24.9
Mortar	,,	0.6	0.5	3.0	6.2	6.4
Plaster	Tons.103	250	235	900	2,870	3,000
Bricks	109	3.4	2.8	7.5	20.8	21.4
Window glass	m2.106	23.7	34.2	44.7	99.8	112.7
Refractory materials	Tons.106	0.6	0.7	2.6	5.9	6.3
Asbestos-cement roofing tiles	Standard tiles.106	9	39	206	1,488	1,810
Asbestos-cement pipe ...	Km.	—	—	1,259	12,148	13,232
Tiles (ceramic)	106	30	—	173	472	5,000

Another table shows the increase in output of cement in 1956 over that for 1929, in comparison with the figures for the USA, Great Britain, Japan and the countries of Western Europe. For example, the USSR output of 24.9 million tons in 1956 is 11.3 times the 1929 figure, whereas the corresponding factor for the USA is 1.8.

An important factor in the growth of the industry is the planned change in its geographical distribution, to exploit the resources of the eastern regions. Figures are quoted to show the increase in the percentage contribution of these regions to the output of a number of products, e.g. in 1928 they produced 12 per cent of the total output of window glass and in 1956 this had risen to 21 per cent.

Output Rise Due to Modernisation

The rapid rise in output in all branches of the industry is attributed to the introduction of modern, high-capacity equipment, to mechanisation and partial automation and to improvements in techniques. Figures are quoted to show the effect of these factors on productive capacity, the quality of products and savings in raw materials.

In spite of this encouraging picture the remainder of the article emphasises the deficiencies of the industry. It is evident that present production and, in some cases, present quality, fall far behind requirements.

Taking the glass industry as an example some account is given of the increasing variety of products and special materials being developed abroad, especially in the USA. For example X-ray and gamma-ray absorbent glasses for atomic energy projects, special optical glass for high-speed aerial photography, etc. The inference presumably is that some or all of the products mentioned are not produced in the USSR. It is stated that the expansion of production of these various types of glass in the USA is directly connected with increasing military requirements. Mention is made of the construction of an 'ultra-modern', $34 million factory, which 'according to the American press . . . is almost completely financed by the Defence Administration'.

Under the sub-title 'Problems of further development' a long list is given of requirements which must be met in order to 'liquidate' the deficiency in housing, highway construction, etc., in the next 10-12 years.

Cement Production. Existing establishments must be enlarged and reconstructed. New factories must be built, incorporating all the most modern equipment such as rotary kilns of 2,000 tons per day capacity, conveyor calciners for the dry method of production, etc. More cement should be packed in paper bags, using turntable packaging machines. The output per man per year should be 2,000 tons or more. Attention is drawn to part of Mr. Khrushchev's report to the Jubilee Session of the Supreme Soviet (6 November 1957), in which he stated that the output of cement must reach 90 to 110 million tons per annum within 15 years.

Glass Production. The productivity of melting tanks must be increased and the process time reduced by the use of accelerators. Improved refractory materials are required to increase the availability time between maintenance breaks. Quality must be improved, particularly with respect to transparency and streakiness of sheet glass. The methods of direct drawing from the melting tank and horizontal drawing must be widely introduced. The enrichment of raw materials must be carried out at the source, with the installation of hydrocyclones at the quarries. Many new types of glass products need to be developed, e.g. foamed glass; heat-resistant, flange-jointed glass pipes of large diameter; curved sheet for 'panoramic' windscreens, etc.

Many other similar points are made, and the production of ceramics and refractory materials is discussed in the same way.

New Dual-Purpose Soil Steriliser From Plant Protection Ltd.

A NEW chemical—Sistan—for sterilising soil in glasshouses has been introduced by an ICI subsidiary, Plant Protection Ltd., Yalding, nr. Maidstone, Kent.

No details of the formula are available yet for publication. However, ICI speak of Sistan as an outstanding fungicide and as much better than formaldehyde as a soil steriliser, enabling disease, eelworms and weed-seeds to be treated in one operation with one chemical which can be applied easily and at economic cost.

The price of enough Sistan to treat one acre is approximately £175. With this new chemical it is claimed that yields up to 10 per cent higher than with formaldehyde may be obtained. Company tests have shown that Sistan kills the spores and mycelium of verticillium, fusarium and didymella; is effective against colletotrichum, and gives good weed control.

The chemical begins to decompose and vaporise as soon as it is diluted with water and can be applied either by diluting or watering on to the soil, or by injection. The fumes are harmful to plants and the firm states that for at least 3 to 4 weeks after treatment the soil should remain unbroken. Like many other insecticides, Sistan may irritate skin, eyes and nose.

NCL Open Days at Teddington

Work in progress at the National Chemical Laboratory, Teddington, will be shown during the 'open days' to be held on 21 and 22 October. Applications for invitations to the morning and afternoon sessions on each day should be sent to the director not later than 20 September.

New Method for Cathodic Protection Against Water Corrosion

A NEW method of providing internal cathodic protection for steel pipes subject to corrosion from salt water has been recently developed by Cathodic Corrosion Control Ltd., Duncan House, Dolphin Square, London SW1.

Cathodic protection, the makers say, has been limited in application because of high costs, but with the development of CX3 alloy anodes should become an economic proposition. Unit anodes are inserted in unlined steel pipes and the protective current is controlled externally. Conventional potential checks on the system can be made using potential measuring pockets accessible externally. Associated water storage tanks and condensers, it is said, may also be tied into the system.

The standard anode unit consists of four separate sections:—

(1) Anode of CX3 lead alloy which can be supplied in various sizes to allow for variations in pipe diameter.

(2) Support rod, insulated with neoprene.

(3) Unit head of forged steel that bolts to the pipe mounting and incorporates the electrical connection box.

(4) Pipe mounting: a forged 3 in. flanged nozzle welded into the pipe to carry the unit head and containing the moulded neoprene stuffing block.

The amount of dc current required to protect a surface is dependent on the surface area. For this class of work it is stated to have been found to approximate to an initial mean value of about 20 milliamps/sq. ft. for bare steel in contact with sea water.

SI-RO-SET DURABLE CREASE PROCESS LICENSED IN UK

THE introduction into Britain of the Australian SI-RO-SET system of setting durable creases in woollen fabrics was announced on Monday by Mr. H. P. K. Wood, chairman of the International Wool Secretariat.

The new process was devised in the Australian Wool Textile Research Laboratories of the Commonwealth Scientific and Industrial Research Organisation, and patents have been applied for in every important clothing-manufacturing country.

CSIRO have signed a formal agreement with Marks and Spencers Ltd., backers of a process developed separately by Professor J. B. Speakman, of Leeds University, to the same end, under which neither will oppose patents applications made by the other.

Three British chemical manufacturers have been licensed to supply the clothing trade with concentrated ammonium thioglycollate bearing the SI-RO-SET trade mark, the purchase of which gives the user automatic licence to employ the pleating process for which patents have been applied. These firms are Albright and Wilson (Manufacturing) Ltd., Knightsbridge Green, London SW1, Robinson Brothers Ltd., Ryders Green, West Bromwich, and Toni Cosmetics, Harlequin Avenue, Brentford, Middlesex.

It is understood that production of the chemical will not require new plant or processes to be set up, as thioglycollic acid and its compounds have for long been the basis of the considerable trade in permanent waving solutions for hairdressing, and of cosmetic depilatories.

The durable creasing of woollen fabrics by the SI-RO-SET process is reminiscent of the technique used for the permanent waving of human hair.

Equipment required to operate the SI-RO-SET process includes a spray booth with forced ventilation, a spray gun with plastics supply lines, and polythene storage and mixing vessels. The ammonium thioglycollate solution must be kept free of iron contamination

The material to be creased is first sprayed with a dilute solution of ammonium thioglycollate; then within 15 minutes it must be steam pressed for at least 20 seconds and then baked at steam heat for 20 seconds. In effect, the thioglycollate breaks down a proportion of the disulphides in the wool fibres and makes the hydrogen ions more accessible to permanent rearrangement by the action of pressure, heat and moisture. This arrangement, it is claimed, should last as long as the material.

Certain precautions have to be taken. The solution reacts with iron and certain other metals and may cause discoloration. Certain dyes, and some sewing threads and linings, are adversely affected.

Cost of applying the process in a clothing factory should not, it is claimed, exceed 6d a garment

Biostat Increases High Grade Whale Oil

FURTHER experiments (CHEMICAL AGE 1957 **78**, 322) with the antibiotic oxytetracycline, marketed in Britain under the name of Biostat by Pfizer Ltd., 137–9 Sandgate Road, Folkestone, were described at a recent press conference held by the company. In association with the whaling firm, Compania Argentina de Pesca, Pfizers have tested methods of injecting antibiotic into whales to restrict meat deterioration before the carcase could be brought to a shore station or factory ship for processing. Work previous to these experiments had been done on this question in Canada (CHEMICAL AGE, 1957, **77**, 168) and Norway.

The most effective method of injection so far discovered was by blowing the solution along the air line into the peritoneal cavity (where putrefaction normally begins) when the whale is inflated before towing. In some cases intraperitoneal injection is supplemented by intrathoracic injection when damage has occurred to the lungs. Earlier tests, incorporating the antibiotic in the harpoon bomb head, had shown this method was not so good and was expensive—each mishit cost approximately £8, the price of one 55 gm. dose.

Because results in the whaling industry depend so largely on such conditions as weather, carcase size, temperature, etc., satisfactory statistics had been difficult to compile. It would appear, however, that the amount of grade 1 and 2 oils (for human consumption) could be increased at the expense of grade 3 and 4 oils (for industrial use) by approximately 15 per cent. The quality of the whale meat had also been found to improve after the use of antibiotic, since the amount of free fatty acid decreased.

Both oil and meat obtained from whales treated with this antibiotic could be sold in the UK for human consumption since no demonstrable antibiotic activity had been found during tests to have outlasted normal processing actions. Further tests are being carried out by Pfizers on other antibiotic preparations for various uses at the present time.

Ciba Introduce New Anti-Leprosy Drug

THE new anti-leprosy drug, Ciba 1906, of Ciba Laboratories Ltd., Horsham, was discovered in the company's research laboratories and has been under chemical trial, mainly in Nigeria, for 3½ years. Experimental work on the compound in 1953 showed that it was effective against *M. tuberculosis* and prompted its clinical trial in tuberculosis and subsequently in leprosy.

Formerly known as SU 1906, Ciba 1906 is 4-butoxy-4′-dimethylaminodiphenyl thiourea, often abbreviated to DPT (also known as thiocarbanilide). It is a white, almost tasteless powder melting at 91° to 94°C. It is sparingly soluble in water and readily soluble in acetone. The drug is administered orally.

Advantages claimed for DPT are: that it is as active or more active than DDS; it is better tolerated; no unpleasant reactions; no case of resistance has been noted to date; all patients have responded; no lepra reactions; and unlike the sulphones, it has not caused depression. There is evidence that the drug produces a more rapid reduction in bacterial count and a correspondingly quicker chemical improvement. The drug is effective in combination with dapsone and INH.

This new Ciba drug is being made in a new building at Horsham, Sussex. The first production run was officially started last week by Mr. Derek Walker-Smith, Minister of Health, who was introduced by Sir Arthur Vere Harvey.

Mr. Philip Mair of Ciba, who also spoke at the ceremony, said that last year Ciba spent nearly £3 million on research towards the discovery of new drugs. He also said that the company was at present erecting a new process building and plant at the chemical works near Grimsby. The plant embodied the results of some years of work and would have a number of unique features.

DSIR's New Laboratory At Stevenage is Named

WORK on air pollution and the synthesis of oil and chemicals from carbon monoxide and hydrogen are to be the first projects on the research programme of the DSIR's new station under construction at Stevenage, Herts.

The laboratory, to be known as the Warren Spring Laboratory, is to be under the direction of Mr. S. H. Clarke, C.B.E., and is planned as a versatile unit free to carry out work on any subject of national importance which cannot be fitted into the schedule of any other research body.

Britain Europe Committee Formed

To promote interest in the proposed European free trade area the Britain in Europe Committee has been formed under the chairmanship of Sir David Kelly. Main function of the committee will be to undertake or sponsor original research on European economic integration and to make known the results.

Mr. Martin Maddan, MP, is hon. treasurer and the hon. secretary is Mr. E. G. Thompson, technical sales manager, Baird and Tatlock Ltd.

ORGANIC FLUORINE CHEMISTRY

Summaries of Papers Presented at Carlett Park Symposium

THE interest in recent years in fluorine chemistry was further demonstrated on 3 July when a 'Symposium on organic fluorine chemistry' was held at the Central College of Further Education, Carlett Park, Eastham, Cheshire.

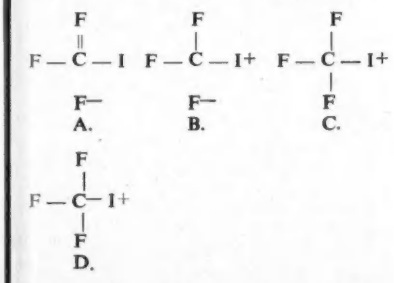
It will be recalled that only recently a symposium on fluorine chemistry was held in the north-west, and this latest symposium amply justified the efforts of the organisers in view of the quality of the papers presented and the attendance.

Speakers included: Professor R. N. Haszeldine and Mr. J. M. Birchall (Manchester College of Science and Technology); Dr. M. W. Buxton (Imperial Smelting Corporation); Dr. W. H. Wilson and Mr. S. Sherratt (Imperial Chemical Industries Ltd.); Dr. J. Burdon (Birmingham University); Mr. K. Greenaway and Mr. W. A. McMullen (Carlett Park).

Nucleophilic Reactions of Halogeno-Fluoro Carbons

FLUORO carbons could be regarded as the parent compounds of a new branch of chemistry as hydrocarbons were the parent compounds of the familiar organic chemistry, stated Mr. W. A. McMullan in his paper, 'Nucleophilic reactions of halogeno-fluoro carbons.' One aspect of the reactions of this potential series, would be considered, namely, nucleophilic reactions of the halogen substituted fluorocarbons. These compounds, and those containing some hydrogen, differed from the corresponding alkyl compounds in their nucleophilic reactions, to the extent that completely fluorinated halogeno carbons did not undergo such reactions at all under normal conditions.

Early work on compounds of the type CF_2Cl_2 and CHF_2Cl i.e. (2 or more F attached to C) had indicated a shortening of the carbon chlorine and carbon fluorine bond lengths. This shortening implied a stronger bond between C and F and C and Cl which was in agreement with the properties of these compounds, since they did not readily show nucleophilic reactions. It might be expected that the more polarisable the halogen attached to the CF_3 groups, the more readily would double bond formation be possible. Thus the contribution of the canonical forms involving $C = X^+$ to the resonance hybrid would decrease in order. $I > Br > Cl > F$



So in the case of CF_3I form A and particularly B would contribute appreciably to the resonance, thereby producing shortened and strengthened C–F and C–I bonds. However, Coles and Hughes reported that the C–F bond was the only one which was appreciably shortened, and a survey of bond length data available indicated that the contribution of canonical forms involving $C = X^+$ actually decreased in the order $F > Cl > Br > I$. This was in accord with the reactions of CF_3I. In effect, apparent absence of reactions involving nucleophilic replacement of iodine did not necessarily mean that C–I bond was shorter or stronger, since it could be accounted for by reversed polarity of the C–I bond ($C^- — I^+$) i.e. with appreciable contributions of (C) (unimportant in alkyl halides) and only slight contribution of the form D.

The liquid fluoroiodides were not appreciably ionised, but the existance of ions in alcoholic solution could be deduced by the study of exchange reactions between CF_3I and NaI containing radioactive iodine. The reaction might proceed thus

$$CF_3I \rightleftarrows CF_3^- + I^+$$
$$I^+ + (^{131}I)^- \rightleftarrows I_2 \rightleftarrows I^- + (^{131}I)^+$$
$$CF_3^- + {}^{131}I^+ \rightleftarrows CF_3{}^{131}I$$

Rate of the reaction was proportional to the concentration of CF_3I and independent of the concentration of NaI. Thus although initially one might have expected CR_3I to be the analogue of CH_3I and to exhibit similar chemical reactivity, the presence of three fluorine atoms obviously had a substantial effect on the C–I bond.

In the nucleophilic reactions of fluorohalogeno methane there were two series of mechanisms which could operate. When the compound contained hydrogen nucleophilic attack would take place on the carbon in a manner resembling the alkyl halides. Mr. McMullen stated:

A. $OH^- + CH.Cl.F—I \rightarrow HO.CH.Cl.F + (I^-)$

$$\xrightarrow{-HF} H.CO.Cl \xrightarrow{KOH} H.COOK$$

When 2 or more fluorines were present on the same carbon as the iodine, reaction took place by mechanism B.

B. $OH^- + I—C.ClF_2 \xrightarrow{\text{Solvent}} HOI + CClF_2^- \longrightarrow CH.Cl.F_2$

In reaction B, CF_2ClI and CF_2H. give carbonate and halide and only low yields of hydrogeno compound; this would indicate either instability of the $CClF_2$ and CHF_2 ions or carbonate formation via A. Increase in the positive character of iodine facilitates mechanism B and yields of hydrogeno compound are at a maximum with CF_3I. The formation of the ether CF_3CHFCF_2OEt during the hydrolysis of $CF_3CF_2CF_2I$ is in accord with the intermediate formation of C_3F_7 ion.

$$OH^- + I—CF_2.CF_2.CF_3 \rightarrow HOI + C_3F_7^-$$
$$F—CF(CF_3)—CF_2^- \xrightarrow{EtO^-}$$
$$F^- + C_3F_6 \longrightarrow CF_3.CHF.CF_2.OEt$$

It did not follow, however, that nucleophilic reactions with perfluoroalkyl iodides were impossible, and a possible approach had been revealed recently by the realisation that perfluoralkyl iodides (RI) were weak Lewis acids and formed complexes with neutral molecule (Lewis bases. B. eq. (NR'_3 OR'_3 R'OH). It had been found that the spectra of polyhalogenoiodoalkanes containing halogen (other than I) on the α carbon C.C.I varied greatly with solvent. Shifts in λ max. of up to 20mμ could occur with change in solvent.

This order of shift was considerably greater than the usual slight solvent effect observed for unsubstituted alkyl iodides. The maximum moved to shorter wavelengths as the solvent changed from non polar to polar in type. The shift of the maximum was associated with solvents containing an atom or atoms (e.g. O or N) having lone pairs of electrons; progressive dilution of such solvents with light petroleum brought the maximum back to a longer wavelength.

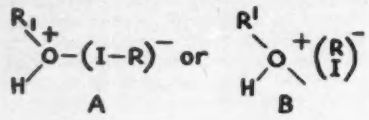
The marked solvent effect depends on both the α and β substitution on the iodo compounds C.C.I.

When the compound had fluorine on the α carbon but not on the β carbon the solvent effect was appreciably increased. Substitution of the α carbon thus determined the value of solvent effect more than did substitution on the B carbon, but B substitution has an effect and was shown in compounds. In type R.CHF.CF_2.I (R = F or polyfluoralkyl) the solvent effect becomes large (10–12 mμ). It was noteworthy that the solvent effect was largest (Δ = 20 mμ the highest value obtained), when the β carbon carried no H or alkyl groups, but only fluorine or perfluoralkyl groups e.g. C_3F_7I. The explanation of these phenomena was founded in the concept of electron-donor-acceptor interaction between the polyhalogeno iodo compounds and the solvent.

It was clear, stated Mr. McMullan, that the true spectra of the iodo compounds were those obtained in the light petroleum spirit since these closely resembled the spectra of the vapours. The valency bond in the RI molecule therefore changed appreciably when an O- or N- containing solvent was used.

The author suggested that in a solution

of a neutral base B (NR^1_3 OR^1_2 R^1OH, etc.) the iodo compound RI formed a 1:1 and 1:n molecular complex of the donor acceptor type, the donated electron in the structure $\psi (B^+ — (RI)^-)$ being derived from the lone pair of electrons in B. From the wave functions, structures such as A and B had been suggested for the



A B

complexes involving transfer of an electron from B to RI with the formation of a weak covalent bond between B^+ and RI^- with resonance in the excited state involving structures for B such as C and D.

B C

The shift in λ max increased as the inductive effect of R in RI becomes greater, i.e. as the number of electronegative substituents on the α carbon of RI increases. In the weak molecular complex of the type postulated the more positive the α carbon atom in RI, the more positive would be the iodine atom, and the ease of change transfer from the oxygen or the nitrogen of the base should increase. RI thus acted as a neutral molecule Lewis acid by virtue of the incompletely satisfied electronegativity of its iodine atom. A careful study of λ max figures available had shown that in a basic solvent such as ethanol the C–I adsorption was very similar to that of an unsubstituted primary alkyl iodide, in either alcohol or light petroleum. If in the basic solvent the fluoroiodide was nearly part of a complex, it was suggested that by use of such a complex where the C–I bond approached more nearly to that of ethyl iodide in character it might be possible to effect synthetic reactions involving ionic intermediates which were difficult if not impossible to effect with polyfluoro iodo compounds in solvents where complex formation could not occur.

Problems of Fluorine Production and Handling Considered by W.H. Wilson

IN his consideration of 'Problems of fluorine production and handling' Mr. W. H. Wilson (Imperial Chemical Industries Ltd., research department, General Chemicals Division, Widnes), said that preparation of fluorine by Moissan in 1886 ended a search for the element that had lasted over 70 years. Moissan's essential discovery was that anhydrous hydrogen fluoride is rendered conducting by the addition of potassium fluoride. The system KF-HF has been employed in all subsequent fluorine cells although the proportions of the two constituents have varied widely. Three composition ranges are attractive on the grounds of a low partial pressure of HF over liquid mixtures; these correspond to so-called low (<20 °C), medium (~80 °C), and high temperature (~250 °C) cells.

Highlights in the development of cells for fluorine were outlined from the time of Moissan to the present day. Consideration was given to the difficulties encountered and the reasons for the present day widespread use of medium temperature cells. One of the greatest problems in fluorine cell development had been that of finding a suitable anode material. Platinum anodes, as used by Moissan, were severely corroded as were those of other metals such as nickel. Graphite disintegrated at HF contents greater than KF:1.8HF. Carbon anodes were now normally employed but in some present day cells anode polarisation was still a recurrent phenomena. By using a suitable form of amorphous carbon, anodes could be achieved which did not disintegrate or wear and which were entirely free from polarisation. Such anodes have operated satisfactorily for periods of several years without breakage or polarisation. Mr. Wilson showed modern carbon anode, medium temperature cells.

Medium temperature electrolyte, he said, did not wet carbon and this gave rise to peculiarities in the way in which fluorine was liberated at carbon anodes. Novel and simple forms of cell could be constructed making use of these peculiar features.

The ease with which fluorine could be made on a small scale was shown by preparing it in a simple (tin-can) cell. The reactivity of fluorine towards organic matter was demonstrated and also other properties of fluorine, using chlorine trifluoride.

Materials, apparatus and methods for handling fluorine on the laboratory and plant scale were illustrated and described. Nickel, copper and steel were satisfactory construction materials, remarked Mr. Wilson, and glass could be used provided HF was absent. Hydrogen fluoride could be largely removed from fluorine by absorption in sodium fluorine; final traces could be removed by refrigeration with liquid air.

Arrangements For 1959 Fluorine Symposium

A SYMPOSIUM on fluorine chemistry, to be held at Birmingham University, is being arranged under the auspices of the Chemical Society for 15-17 July, 1959. Topics in organic, inorganic and physical chemistry will be covered. Provisional acceptances have been received from the following speakers: R. Belcher, E. D. Bergmann, H. J. Emeléus, G. C. Finger, R. N. Haszeldine, A. L. Henne, E. T. McBee, G. A. Olah, J. S. Rowlinson, A. G. Sharpe, P. Tarrant, J. C. Tatlow, F. Weygand and D. H. Whiffen.

A few further contributions can still be considered. Requests for further details, expected to be available early in 1959, and other communications, should be addressed to the secretary of the fluorine symposium, Chemistry Department, the University, Edgbaston, Birmingham, 15.

Three Main Synthetic Uses of Trifluoroacetic Anhydride Discussed

'Synthetic uses of trifluoroacetic anhydride' was the subject of the paper by J. Burdon (Birmingham University). Reference was made to the three main synthetic uses of trifluoroacetic anhydride:

(i) As an acylating catalyst; (ii) as a trifluoroacetylating agent; and (iii) as a dehydrating agent.

The acylating properties of trifluoroacetic anhydride carboxylic acid equimolecular mixtures are believed to be due to acylium ions ($R.CO^+$). These mixtures convert alcohols into esters, aromatic compounds into ketones, and olefins into α-keto-olefins, all in excellent yields. Acetylenes give β-diketones, but in poor yield, and acetal rings are cleaved to give partially substituted polyols.

Mixtures of oxygen-containing acids (HOX) with trifluoroacetic anhydride give reactive cations, X^+. Nitration ($X^+ = NO_2^+$), tosylation, and halogenation ($X^+ = Hal^+$) all proceed in good yield. Hydrogen peroxide gives a peroxy-acid ($X^+ = OH^+$) which oxidates aromatic amines to nitro-compounds, olefins to epoxides or glycols, ketones to esters, and oximes to nitro-paraffins.

Hydroxy- and amino-compounds give *O*- and *N*-trifluoroacetyl derivatives, respectively, with trifluoroacetic anhydride. As these groups can be removed under exceptionally mild conditions they are useful for blocking purposes. *N*-Trifluoroacetylaminoacids have been used in peptide syntheses and *O*-trifluoroacetates to prepare partially substituted sugars.

With regard to its use as a dehydrating agent trifluoroacetic anhydride takes up water very readily: it dehydrates *N*-acylaminoacids to either 5-oxazolones or *N*-acylaminoacid anhydrides, *N*-nitroso-*N*-phenylglycine to *N*-phenylsydnone, and dialkyl phosphoric acids to tetra-alkyl pyrophosphates.

Brymays Open New £300,000 Match Factory

BRYANT AND MAY LTD., have opened in Glasgow a new £300,000 match factory with features claimed to be unique in Europe. Provision is made for paraffin wax to be delivered by insulated road tankers in the hot molten state and pumped into heated underground storage tanks from whence it is piped in liquid form to dipping tanks on the match-making machines.

Drying the heads of the 4 million matches ultimately to be produced every hour will involve evaporating half-a-ton of water daily and dispersing it through an accurately controlled air conditioning system. The natural high humidity of the area created problems in the preparation of the striking-head composition, but these have been overcome by the double milling of the ingredients. Matchsticks are to be delivered to the factory already impregnated with glow-inhibiting ammonium phosphate.

The new factory, with its 30,000 square feet of floor space, is a single storey, brick-built, steel-framed building, and is scheduled to increase the firm's output of matches by 60 per cent.

FREE RADICAL REACTIONS OF FLUOROHALOGENO CARBONS

DISCUSSING 'Free radical reactions of fluorohalogeno carbons', Mr. K. Greenway said that in the student paper by Mr. W. A. McMullan it had been pointed out that nucleophilic additions to trifluoroiodomethane were difficult to bring about though not impossible. The inductive effect of the 3 F atoms increased the positive character of the iodine atom and tended to reverse the normal polarity of the C-I bond, thus making it possible for the bond to split homolytically. Trifluoroiodomethane when heated or exposed to u.v. light produced trifluoromethyl radicals, and iodine atoms

$$CF_3I \xrightarrow[\text{u.v. light}]{\text{heat}} CF_3. + I.$$

The quantum yield was low, since primary recombination occurred preferentially, but it might be increased by the introduction of a second component capable of reacting with either the radical or atom.

Reactions of trifluoromethyl radicals: Trifluoromethyl radicals would abstract hydrogen from water at high temperatures. In the presence of mercury, mercuric hydroxide was also produced, and the reaction could be represented as

$$CF_3. + H_2O \rightarrow CF_3H + .OH \xrightarrow{Hg} Hg(OH)_2$$

Organic liquids underwent reaction with trifluoroiodomethane when heated to 200 °C. Ethyl alcohol, for instance, gave fluoroform and acetaldehyde.

Acetaldehyde was also formed from trifluoroiodomethane and ether, and a trifluoromethyl radical would also abstract hydrogen from *n*-hexane giving fluoroform and *n*-hexene.

The addition of mercury in these reactions decreased the temperature required to cause an appreciable thermal reaction, and its function was clearly to prevent primary recombination of the trifluoromethyl radical and the iodine atom.

Olefins: Trifluoromethyl radicals would also add smoothly to olefins. When a mixture of trifluoroiodomethane and ethylene was heated or exposed to light compounds of the general formula $CF_3.[CH_2.CH_2]_nI$ were formed:

$$CF_3I \xrightarrow{uv} CF_3. + I.$$

$$CF_3. + C_2H_4 \rightarrow CF_3.CH_2.CH_2. \quad \text{Initiation}$$

$$CF_3.CH_2.CH_2. + C_2H_4 \rightarrow CF_3.CH_2.CH_2.CH_2.CH_2. \text{ etc.} \quad \text{Propagation}$$

$$CF_3.CH_2.CH_2. + CF_3I \rightarrow CF_3.CH_2.CH_2.I + CF_3. \quad \text{Transfer}$$

The value of $_n$ in $CF_3[CH_2.CH_2]_nI$ was mainly one, with small amounts of compounds where $_n$ = 2,3,4, since the transfer step was efficient. By using C_2F_4 instead of ethylene long-chain fluoroalkyl iodides might be prepared.

Photochemical oxidation: Many fluorine compounds were rapidly broken down when mixed with oxygen and exposed to ultraviolet light. Irradiation of a compound such as C_3F_7I in the presence of oxygen caused a rapid and complete breakdown to COF_2. The mechanism of the chain reaction by which this takes place was thought to be:

$$C_3F_7I \xrightarrow[\text{light}]{\text{u.v.}} C_3F_7. + I.$$

$$C_3F_7. + O_2 \rightarrow C_3F_7O_2.$$

$$C_3F_7O_2. + C_3F_7I \rightarrow C_3F_7O.OI + C_3F_7. \quad (C_3F_7. \xrightarrow{O_2} C_3F_7O_2. \text{ etc.})$$

$$C_3F_7O.OI \xrightarrow[\text{u.v. light}]{} C_3F_7O. + .OI$$

$$C_3F_7O. \rightarrow C_2F_5. + COF_2$$

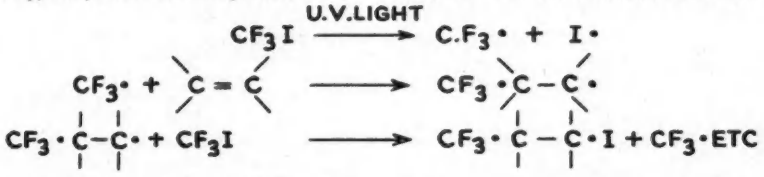
$$C_2F_5. + O_2 \rightarrow C_2F_5O_2. \xrightarrow{C_3F_7I} C_2F_5O. + C_3F_7. + .OI$$

$$CF_3. \xrightarrow{O_2} CF_3.O_2. \text{ etc.} \quad (CF_3. + COF_2)$$

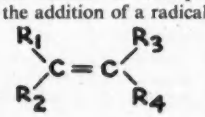
Mr. Greenway said that the rapid breakdown of CF_2 chain which was normally extremely stable, was believed to follow formation of a perfluoroalkoxy radical of the $R.CF_2.CF_2.O.$ type, which could then split off a molecule of COF_2 and liberate $R.CF_2$. The reaction intermediates could undergo side reactions to give fluoro-acids, in the presence of water or when Br_2 was used as sensitiser:

$$C_3F_7.OI \xrightarrow{NaOH} C_3F_7.OH \xrightarrow{-2F^-} C_2F_5.COOH.$$

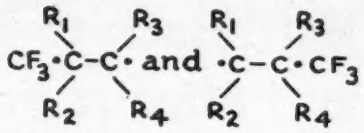
Orientation during free radical reactions: The trifluoromethyl radical could be used to determine orientation during free radical addition reactions. Trifluoroiodomethane reacted smoothly with olefins when exposed to u.v. light, and the conditions could be so controlled that only the compound CF_3(olefin)I was the main product.



The method usually adopted was to react trifluoroidomethane with an unsymmetrical olefin and subsequently determine to which carbon atom the initiating trifluoromethyl radical had become attached, and whether the attack was exclusively on the one carbon atom. The results obtained indicated that in an olefin of the type $R.CH = CH_2$, the direction of addition (where R = Me,Ce,F,COOMe, CF_3,CN) was independent of the polarisation of the double bond, as all these olefins underwent exclusive radical addition at the CH_2 group although the nature of the substituent R did affect the rate of addition. It seemed probable, suggested Mr. Greenway, that the nature of the products obtained by the addition of a radical to an olefin



depended upon the relative stability of the two possible intermediate radicals produced in the initial reaction.



The products obtained were entirely those of the type $CF_3.[CF_2.CF_2]_nI$. The value of n in this case had a wider range than with ethylene products, since all the compounds contained a $—CF_2I$ group with a C–I bond very similar to that in trifluoroiodomethane itself.

This reaction between CF_3I and C_2F_4 was an important one. It enabled a chain of CF_2 groups to be built up, and at the same time a functional group 'I' was retained at the end of the chain. Using CF_3I, compounds of the general formula $CF_3[CF_2.CF_2]_nI$ could be obtained where n = 1–20. The individual members of the series were easily separated by distillation.

In a similar manner to the above reaction 1:2 di-iodotetrafluoroethane underwent reaction at each end of the chain, and as a result of the reaction some compounds of general formula $I[CF_2.CF_2]_nI$ have been obtained which might be used to prepare a series of difunctional fluorocarbon derivatives.

Acetylene: Acetylene and trifluoroiodomethane when heated or irradiated reacted readily to give the compound $CF_3.CH = CH.I.$ in good yield. On dehydroiodination $CF_3.CH = CHI$ was converted into $CF_3.C = CH$, trifluoromethyl acetylene, which underwent many of the reactions associated with acetylene itself. For example, the H atoms could be replaced by metals with the formation of acetylides.

Synthetic uses: The compound $CF_3.CH_2.CH_2I$ produced from the reaction between ethylene and trifluoroiodomethane was readily converted to the olefin $CF_3.CH = CH_2$ by alcoholic potassium hydroxide. Both this compound and $CF_3.CH = CHI$ were readily oxidised to trifluoroacetic acid $CF_3.COOH$ by $KMnO_4$. These reactions provided a general route for the introduction of a functional group into a fluorocarbon:

$$CF_3I \xrightarrow{C_2F_4} CF_3[CF_2]_nI$$

$$CF_3.[CF_2]_nI + C_2H_2 \rightarrow CF_3.[CF_2]_n.CH = CHI$$

$$CF_3.[CF_2]_n.CH = CHI \xrightarrow{KM_nO_4} CF_3[CF_2]_n.COOH.$$

1958 Industrial Chemistry Congress

The XXXIst International Congress of Industrial Chemistry will be held from 7 to 20 September 1958, at Liege in Belgium.

Alembic Says, Pass 'Polythene Ball' Back to BSI and Plastics Federation

'CHEMICAL AGE' certainly started something with its 'polythene-polyethylene' poll. Not only has it brought the controversy into the open, it has also clearly shown that the issue will not be settled for a long time.

Besides leading 'Chemical Age' to abandon its three months allegiance to 'polyethylene,' it has even caused a 'split' in the editorial office. Perhaps to prevent a more serious rift, the editor has asked me to sum up my views of the poll and the letters published in 'Chemical Age.'

For the sake of unity I have toed the editorial line in accepting the switch back to polythene. But a closer reading of the correspondence shows that I am well and truly 'on the spot.' The editor decrees that the polymers of ethylene are to be referred to as 'polythene' in future; but British Resin Products (CA, 19 July, p. 107) say that to call Rigidex polyethylene 'polythene' is a misdescription.

What is a mere columnist to do? If I heed the editor and preserve my job the wrath of BRP will be aroused and presumably by misdescribing their product, I could be hauled before the courts under the Merchandise Marks Act. A compromise might be to refer to ICI's 'polythene polyethylene' or to Rigidex 'polyethylene polythene.' Another alternative would be to take the advice of the purists and follow ICI's own example in filing their patents by using 'polymethylene.' While being more accurate, this would, however, add to the confusion and invite ridicule. (At any rate ballot-weary readers may like to know that I do not intend to hold a poll on what term Alembic should use!).

'No Help from Literature'

Turning to the literature for support is of little avail. Most of it on this controversy has been published in CHEMICAL AGE and it shows all too clearly that nothing is likely to be resolved for many a year.

Correspondence on the subject in CA is, however, worthy of further study. It shows that while ICI had strong support for 'polythene'—they could even count the backing of Dr. V. E. Yarsley, a former polyethylene man—many of the arguments were fairly shallow. Here are some quotes: 'Polythene has the merit of saving two syllables'; 'Let us keep the flag flying'; 'Let us stick to the English expression'; 'We are not crackers enough to describe all biscuits as crackers'; 'What better reason is there than "for the sake of auld lang syne."'

The pro-polyethylenes have been much more convincing. But even so there are some very good reasons for keeping to 'polythene.' The word coined by the British discoverers of ethylene polymers is well-known both to scientists and laymen. It has earned the commendation of the BSI and the British Federation of Plastics.

Why then is it not universally used? Because, say the polyethylene supporters, it became accepted when one firm had the monopoly. They add that while 'polythene' is not the trade mark of one company, the word is so closely associated with it that it would be unethical for competitors to use it. The logic of that is clear; it is also quite clear that the discoverers of the material have every reason for sticking firmly to polythene, the name that carries so much good-will.

In passing I must debunk the accusation that 'polyethylene' is an Americanisation. Like polypropylene, polyisobutylene, etc., it describes chemically one particular polymer family. As such it appeals more to the average chemist than a word that is not so precise. Also due for debunking is the claim of some that 'polythene' is a trade name. It is not; ICI's brand name is 'Alkathene.'

Polythene has been with us for more than 20 years; the publicity campaign behind polyethylene in this country is a few months old. My own feeling is that in time it will become increasingly used and eventually supplant polythene as a word. In time, too, BSI and the BPF, will have to admit that the word approved by them when there was only one producer will not do when all the other producers are using 'polyethylene.' These other firms are not as is popularly supposed all American. Newcomers include: British Hydrocarbon Chemicals and Shell Chemicals (both UK) and the US-owned Union Carbide and Monsanto Chemicals.

Mr. G. C. Graver (CA, 19 July, p. 107) suggests that the opinion of leading and impartial British chemists should be sought to decide once and for all which word is to be used. Many of the experts in the polymer field are, however, not impartial. The best known, Sir Robert Robinson, is for instance synonomous with Shell. But who could be more impartial than the secretary of DSIR, Sir Harry Melville.

In his new book 'Big Molecules' (G. Bell, 15s) Sir Harry refers only to 'polyethylene' (p. 138 to p. 142). This week Sir Harry presided at the opening of the DSIR International High Polymer Conference at Nottingham; one of the papers is by A. H. Willbourne of ICI and it is worth noting that its title begins 'Polymethylene and the structure of polythene . . . .'

My immediate dilemma in not being able to please everyone is not likely to be solved until BSI and the Plastics Federation decide to switch to 'polyethylene' or until 'polythene' is used to describe 'polyethylene', as is the case with the coined word 'nylon' and 'polyamides.' Until either happens, it seems that protagonists in this controversy will have to resign themselves to seeing both 'polythene' and 'polyethylene' for some considerable time.

Alembic

Unsintered PTFE Tape Now Available from Durham Raw Materials

PTFE FILM is now available in the UK in an unsintered form permitting easy fabrication into a range of products which can be built up by lapping. It is supplied in the form of tape known as Bonnytape and is available in a range of colours, in widths from ¼ in. to 3 in. and in thicknesses from 3 to 10 thou and is distributed by Durham Raw Materials Ltd., 1-4, Great Tower Street, London EC3, sole selling agents for the manufacturers, Durham and Bonny Ltd., Birtley, Co. Durham.

Bonnytape is produced by a special calendering process giving film which is claimed to be virtually fault-free, and to have considerable strength (1,500-2,000 p.s.i. in the longitudinal direction). In this form it is easily lapped on to the required former, after which it is sintered for a short period at 380°-395°C. During this sintering operation, shrinkage occurs thus ensuring complete fusing at the lap joints, and the final product has a tensile strength two to three times higher than can be obtained by any other means.

Other properties of sintered Bonnytape are those of PTFE itself. They include high heat resistance (it can be used for continual operation up to 300°C), chemical inertness (practically unaffected by almost all known chemicals), exceptional electrical properties and resistance to weathering and extremely low co-efficient of friction. Its unique anti-stick properties give it a wide range of application in the coating of parts handling sticky substances.

The largest use is for the insulation of cables for use at high temperature or under conditions for which long lasting insulation value is essential. It is also used for the production of thin walled tubing and roller coating. Squares can be supplied for the manufacture of fault-free diaphragms.

Overseas News

SD TO DESIGN SECOND JAPANESE ETHYLENE OXIDE-GLYCOL PLANT

AN ethylene oxide-glycol plant for Mitsubishi Petrochemical, Yokkaichi, Japan, which will about double Japanese ethylene oxide production, is to be designed by Scientific Design Co., New York. It is the second to be erected in Japan using the SD direct air oxidation process; the first went on stream in May, 1958, and is operating at full capacity.

SD will supply the process under licence to Mitsubishi. In addition to engineering, SD will oversee construction and initial operation of the Mitsubishi plant. The special catalyst required for the process will also be supplied. The new Mitsubishi venture will represent the seventh Japanese petrochemical plant to be designed by SD.

Mitsubishi Petrochemical Co., who will produce ethylene oxide, ethylene glycol, and other petrochemicals from raw materials supplied by Showa Oil Co. are the tenth company to have selected the SD direct air oxidation ethylene oxide process. The capacity of all ethylene oxide plants completed or in design by SD is equivalent roughly to 35-40 per cent of the total US production. Among companies for whom SD have designed ethylene oxide plants are Naphtachimie and Marles-Kuhlmann, France; Allied Chemical and Dye, General Aniline and Film, and Jefferson Chemical, US; Société Chimique des Derives du Petrole, Belgium; Chemische Fabrik Holten GmbH, and Bayer, Germany; Mitsui Petrochemical, and Mitsubishi Petrochemical, Japan.

Netherlands Salt Raise Capital, Announce Merger

Royal Netherlands Salt Industry have purchased from original participants all the shares of the Royal Netherlands Soda Industry. Total capital of Fls.24 million (£2.4 million) is now owned by Royal Netherlands Salt.

The company has announced that it intends to distribute a one-for-three scrip issue. It also plans to issue further Fls.4.4 million (£440,000 approximately) in connection with its merger with Electro Zuur. These two operations will increase the company's capital by Fls.30 million (£3 million approximately).

Royal Netherlands Salt Industry are merging with the Electro-Zuur an Waterstoffabreik, the Amsterdam chemical firm.

Czech Plans for Increased Chemical Production

Czech plans announced for the period until 1965 include many projects for the expansion of the chemical industry.

The production of synthetic rubber and of new plastics is to be started on a large scale, and the production of detergents is to be much increased.

A factory for the production of synthetic rubber is to be built at Kralupy, north of Prague, the capacity of which is expected to cover about half of total domestic demand. Actual production is to start in 1964.

A new nitrate industry is to be situated in southern Slovakia at Sala. The raw material will be natural gas from nearby fields. This single factory, according to plans, is to provide Czech agriculture with three times as much artificial fertiliser as all the present factories taken together.

Joint US Company Formed by Dow and BASF

A new joint company—Dow Badische Chemical—having a particular interest in acetylene, has been formed in the US. The company, owned half by Dow Chemical and half by the overseas subsidiary of the German company Badische Anilin- and Soda-Fabrik AG, has been incorporated in Delaware with an initial capital of $6 million. Although its operations are still in the planning stage, its main interests will be acetylene chemicals.

Euratom to Spend $11m. on 5-Year Nuclear Fusion Research

Professor Amaldi, chairman of the Euratom Scientific and Technical Committee, has announced a research programme on nuclear fusion to cost $11 million in five years. This will be part of the $215 million research appropriation provided under the Euratom treaty.

Part of the work of the committee will be to co-ordinate the nuclear research in progress in the six Euratom countries. As fusion is still in the early stages of scientific exploration the amount spent on it will be less than on the more immediately practical programmes.

Geigy's Interest in Spanish Chemical Company

Foreign capital participation up to 45 per cent against a previous 25 per cent has been granted to J. R. Geigy, Basle, Switzerland, in Industrias Quimicas SA, Spain, producers of dyestuffs and chemical products. This increase in foreign participation has been authorised by the Ministry of Industry because of Quimica's plans to increase production of intermediates and auxiliaries.

Six New Factories Open in Mexico

Six new factories for the production of chemical and allied products have recently been opened in Mexico. Magnesio SA (capital pesos 4.5 million) in Mexico City are making sulphuric acid, kraft paper bags and magnesium products; Dicalite de Mexico SA, associated with the US firms Great Lakes Carbon and American Carr Materials, have opened a pesos 2 million plant at Tlalnepantla to make dicalite, a perlite-based light-weight building material, and industrial filter elements; a new cellulose factory (capital pesos 30 million) at Matahuela is controlled by the Banco de Comercio; Vitro Fibras SA, a new company controlled by the Monterry brewing family, the Garza-Sadas, with the technical assistance of the Owens Corning Fibre Glass Corporation, has gone into production with a target of 10 tons of fibre-glass a day; and a new chemical factory, Laboratorios Kendrick SA, has opened with a capital of pesos 400,000.

Greater Potassium Salts Production Expected

Production of potassium salts in the Dead Sea area totalled 85,000 tons in 1957. This year the output is expected to reach 100,000 tons. Plans have been worked out to add a flotation plant to Oron Factory. The output of phosphatic fertilisers produced at this factory is being increased from 120,000 to 240,000 tons.

Some Italian technicians have worked out a process which will permit the utilisation of carnallite for the production of fertilisers. As carnallite is abundant in the Dead Sea area and as the technicians in question have succeeded in dispensing with the costly refining of this mineral, excellent results are expected.

Dow Announces Separan Flocculant Improvement

An improved polyacrylamide-type flocculant known as Separan NP10 has been introduced in commercial quantities by Dow Chemical International Ltd. It is claimed that operational characteristics of Separan NP10 are the same as of its predecessor, Separan 2610, which has been discontinued. The new product has, however, higher purity, increased solution clarity and greater product uniformity.

Separan NP10 is used as a flocculant in filtering, thickening and clarification processes in mining, pulp and paper, chemical processing, and water treatment. In waste and sewage treatment, this material is used for recovering valuable materials in waste liquids and in decreasing pollution in bodies of water receiving industrial wastes.

Fungistatic Agent Soluble in Water

Potassium sorbate, a water-soluble fungistatic agent for foods, has been introduced by Union Carbide Chemicals Company, 30 East 42nd Street, New York 17. Potassium sorbate, a white crystalline powder, is more water-soluble than sorbic, a carbide product already used as a food mould inhibitor. Potassium sorbate can be used in preventing spoilage of pickles, syrups, fruit juices, etc.

Trends in the Italian Chemical Industry

Index figures (expressed in percentages of the average monthly output recorded in 1953) compiled by the Central Institute of

	Oct. 1957	Nov. 1957	Dec. 1957	Jan. 1958	Feb. 1958	March 1958
Sulphuric acid	129	121	132	128	119.7	126.5
Carbide of calcium	97.1	94.6	77.8	74.2	61.8	99.8
Tartaric acid	87.3	79.1	80	137.6	191.3	206.4
Tanning extracts (30% T.F.) ...	106.8	125.6	116.5	122.9	121.4	136.1
Synthetic organic dyestuffs ...	141.3	123.7	117.1	120.7	104.8	114.5
Synthetic resins	330.7	332.1	334.1	307.5	301.4	327.6
Carbonated soda	102.8	114.9	123	116.1	96.3	94.1
Caustic soda	147.6	163.4	155.1	141.8	131.5	124.4

Statistics in Rome, show the trend in production of the above chemicals produced in Italy.

Large Scale Ilmenite Production Begins in S. Africa

Large-scale production of rutile and ilmenite is due to begin in South Africa at the end of this month. Production will be started by then at the new £1¼ million plant built by Umgababa Minerals, an Anglo-American Corporation associate. It is expected that full-scale operation will be reached within a matter of weeks.

Capacity of the Umgababa plant is stated to be 100,000 long tons of ilmenite, 7,000 long tons of rutile and an unspecified—but considerable—quantity of zircon annually.

Nearby the Umgababa Minerals plant, at Umbogintwini, African Explosives and Chemical Industries Ltd. are to build a plant to produce titanium pigments.

Argentine Plastics Plant

A plant for the production of plastics materials is to be established in São Paulo through the joint enterprise of Bakol of São Paulo and a German chemical concern.

Dysprosium Metal Produced in Commercial Quantities

Dysprosium metal of 98 to 99 per cent. purity in lump and ingot form is now being produced in commercial quantities by Nuclear Corporation of America at a Burbank, California, plant. One of the 'rare' earths, the metal's neutron cross-section is 1,100 barns. This plus its relatively high melting point of 1,400 degrees C suggests use in nuclear-reactor control rods.

In electronics, dysprosium's paramagnetic properties qualify it as a component of ferrites, or 'garnets', a group of materials with application in microwave equipment.

Australian Mineral Sands Production

Australian production of rutile from 1954 onwards is as follows:

	Rutile (tons) Production	Exports
1954	44,659	44,417
1955	59,613	59,687
1956	96,327	89,887
1957 9 months ...	98,090	95,318
1957 4th quarter ...	n.a.	23,834

Rutile was oversupplied in world markets during 1957. Australian separation plant capacity, according to Professor H. H. Dunkin, University of Melbourne (*Chem. Engng. and Mining Review*, 1958, **50**, No. 7, 39), was considerably enlarged during the year and production of nearly 130,000 tons was 'an all time high'. However, it is substantially below the potential capacity of plant in existence at the end of the year.

Because of lower prices and reduced demand three companies did not equip plant as they had expected. Of the 20 to 25 separation plants on the east coast, at least 8 have shut down temporarily and at least 5 others have curtailed production by more than two-thirds by the first quarter of this year.

Ilmenite production in Western Australia increased to about 100,000 tons for the year. With plant installed during 1957 and more to be installed in 1958, capacity should be about 225,000 tons a year by the end of this year.

Pfaudler Introduce New Glass

New glass, Glasteel 59, introduced by the Pfaudler Co., for lining steel equipment, is stated to have a 30 per cent greater resistance to thermal shock due to its microstructure. Maximum allowable thermal difference between vessel and charge at normal vessel temperature (250°F) is now 260°F. The former limit was 200°F. At a vessel temperature of 450°F, the allowable difference increases from 115°F to 150°F.

Other advantages claimed are: longer corrosion service life; greater resistance to abrasion; and better working properties, hence fewer plugs are required in vessels. Gasket seating is said to be improved because of the microstructure.

US Detergent Output Continues to Rise

Output for all types of detergents in the US in 1957, according to a preliminary Tariff Commission report, was 1.2 billion lb. against 1.1 billion lb. in 1956, a gain of 5 per cent. Sales were 1.1 billion lb. compared with 988 million in 1956. The overall per pound average of sales dropped from 21 cents to 19 cents. (Retail sales are not covered by the report.)

Gains are noted in the production of non-sulphonated esters and ethers, sulphate and sulphonated alkyl, benzenoids, lignin derivatives, and sulphated and sulphonated acrylic surfactants.

Losses were shown in production of nitrogen-containing compounds of all kinds except for some coconut oil amides, which show larger increases. A decline is indicated in phosphorus-containing surfactants and in many types based on oils, fats and waxes.

A notable increase has occurred in the use of lignin derivatives by the surfactants industry. Output of these has risen from 91 million lb. in 1956 to 165 million lb. in 1957.

S. African Titanium Scheme Shelved

Because of falling titanium prices, a £1¾ million scheme for production of titanium by a British Australian titanium corporation in South Cape Province has been shelved.

Claims for Dry Lubricant

A new lubricant based on molybdenum disulphide has been developed by Industrial Engineering Ltd., Melbourne, Victoria. Longer life for all types of machinery, prolonged servicing periods, reduced friction in all moving parts and freedom from the effects of acid action are claimed for it. Known as Molybond, the product is stated to withstand bearing loads up to 200,000 p.s.i.

The company also has a chemical and mechanical method of bonding molybdenum disulphide on to a variety of metals.

Italian Dyestuffs Output Up

According to official statistics, the output of synthetic organic dyestuffs in Italy amounted to 13,099 tons in 1957, as compared with 11,428 tons in 1955.

US Firm Announces New Surface Treatment for Bonding Teflon

FOR joining fluorinated resins such as Teflon (polytetrafluoroethylene) to other materials, a new surface treatment has been developed by US Industrial Chemicals Co., New York. The new process is described in US Patent 2,809,130, and is stated to require only conventional ventilation and to use treating solutions that can be stored for long periods. It, therefore, has advantages over the sodium-ammonia solution surface treatment.

The Teflon surface is bathed at room temperature with a sodium-naphthalene complex dissolved in a solvent such as dimethyl glycol ether. When the surface turns a grey-brown, it is ready for bonding to other materials. A wide variety of common adhesives can be used, including chlorinated rubber types, resorcinol formaldehyde cements, phenolic types and epoxy resins.

Preparation of the solution is specified in the patent. A litre of a molar solution of naphthalene in a dimethyl glycol ether solvent under a nitrogen blanket is reacted with metallic sodium. Formation of the sodium-naphthalene complex is indicated by the appearance of a greenish colour, at which point the Teflon is immersed.

It is believed that the resulting ease of bonding will lead to increased utilisation of Teflon as a corrosion-resistant lining for process equipment and vessels, as a bearing material, and in fluid seals.

According to statements in the patent, peel tests made on an epoxy cement bond between the treated Teflon and a phenol-formaldehyde resin showed that the bond was stronger than the Teflon itself. Similar results were obtained in joining Teflon to metal and rubber with a chlorinated rubber adhesive.

EQUIPMENT REVIEW

Chemical Plant: Laboratory Apparatus
Safety and Anti-Corrosion Products

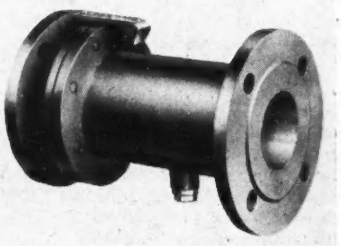
RAIL TANK WAGONS

TANK wagons for class 'A' (inflammable) and class 'B' liquids are being produced by Hurst, Nelson and Co. Ltd., P.O. Box 10, Motherwell. Both the new types are of 35 ton gross laden weight and of electrically butt welded construction, tested by hydraulic pressure to 25 lb. p.s.i.

Each wagon has a pressure type mild steel manhole and load indicating brackets fitted inside the barrel. Those for class 'A' liquids are provided with a 4 in. bore top discharge pipe drawing from a sump at the barrel bottom, as well as a brass air vent with gauzes and dust cap at the top for maintaining surface pressure during discharge, etc. The nett carrying capacity, after allowing 4 per cent for expansion, is 5,903 gall. Those for class 'B' liquids have a mild steel outlet stool welded to the barrel bottom. A cast iron valve, fitted to the stool, is operated from the tank top by a hand wheel. Double-arm outlets, 4 in. bore, are fitted to this type, and its interior contains steam heating pipes manufactured of hot finished seamless steel tubing. Nett carrying capacity (80 gall. expansion allowance) is 5,290 gall.

BELLOWS EXPANSION JOINT

A METAL bellows made from seamless drawn tube of high copper bronze alloy is incorporated in a new expansion joint made by Samson Controls Ltd., 19 Borough High Street, London SE1. The provision



Metal bellows by Samson Controls

of an outer casing and an inner lining is said to ensure that the medium flowing through the pipe-line bears only on the external surface of the bellows. The company claims that, due to even external compression, the bellows are automatically centred and that the medium being passed forms a natural, friction-reducing cushion between the bellows and outer casing. The joint can be insulated in the same way as the pipe because of its smooth surface.

LIQUOR OPACITY RECORDER

THIS equipment for the recording of plant liquor opacity has been developed by the Foster Instrument Co. Ltd., Letchworth, Herts, in conjunction with Laporte Chemicals Ltd. Light from a projection unit falls on a photo-electric cell mounted in a light receiving unit and the variations in current are recorded. Tests conducted on samples of plant liquor are said to have shown the unit to be sensitive to the clarity and opacity of the liquor and of help in determining the most favourable conditions of colour and opacity. Alarm contacts can be set on the recorder to give warning when the permissible limit of opacity is approached.

ARMAFLEX PIPE INSULATION

ARMAFLEX, a new covering for insulating hot or cold pipes of iron and for use on copper tubing made from flexible foamed plastics material, has been marketed by the Armstrong Cork Co., Bush House, Aldwych, London WC2.

It can be applied easily. It is made in sizes to fit any type of pipe from $\frac{3}{8}$ in. to $3\frac{1}{2}$ in. outside diameter and it can be either 'sleeved on' or alternatively slit lengthwise, the seam being sealed with an adhesive which provides a moisture-proof joint.

The makers state that this covering material has a thermal conductivity of 0.28 B.Th.U. at 75° F mean temperature. A half-inch thick wall of the material will, it is claimed, prevent condensation under normal conditions on indoor lines operating as low as 32° F. The material will also withstand temperatures up to 200° F. No finish is required if the Armaflex is applied to indoor pipes but if exposed to weather, it should be protected in the same way as other insulating materials.

REMOTE LEVEL CONTROLLER

REPLACING the Mark II, the Proxicon Mark III dust-and weather-proof industrial level controller can be operated by remote control at distances up to 3,000 ft.

This new capacitance type is designed to control the levels of any liquids or free-flowing solids without necessitating direct contact with the material, and has no moving parts in the container.

J. Edward Hall (Electrical Engineers) Ltd., Clarence Road Works, Leeds 10, have incorporated heavy duty contactor type double-pole change-over relay with 'Elkonite' faced contacts, in place of the Post Office type, and state this alteration gives improved contact life plus increased flexibility in control circuit functions. A 'trigger' circuit is included to ensure quick operation even with a slow capacitance change. A separate signal station unit incorporating the mains voltage signal lamps has been produced to prevent any overheating.

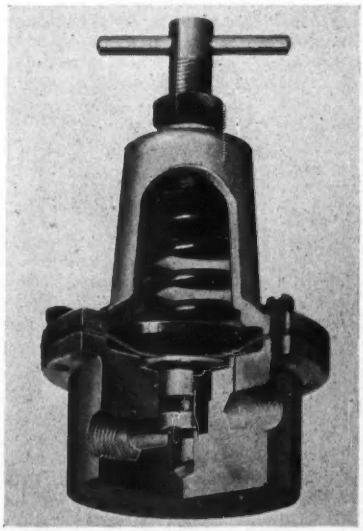
Sensitivities quoted by the company are: greater than 1.0 pf. under all conditions subject to variations of not more than ± 0.25 pf. with mains variations of + 5 per cent to —7½ per cent and not more than ± 1 pf. with temperature variation of ± 20°F from a 68°F datum figure. Relays are enclosed independently and HRC-type cartridge fuses have been included for relay circuits. For simple selection of high or low level operations an electrode switch is provided. The set point is situated in an accessible position and can be easily adjusted on the site.

This equipment is intended to give a guaranteed consistency of operation one instrument to another. The instrument can be supplied for single and dual level applications, voltage ranges 100/125, 200/250 and 360/450 volts, cycle range 40/60. Three voltage tappings are incorporated for each range to enable exact site voltage to be selected. For multiple level applications for up to 24 high and low level control points in any combination the Proxicon Mark III can be custom built to special order.

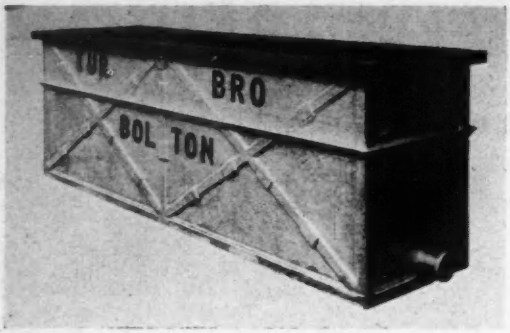
SAFETY LOCK-UP VALVE

IT is stated by Crosby Valve and Engineering Co. Ltd., Ealing Road, Wembley, Middx, that on applications involving the use of diaphragm-operated control valves engineers normally consider whether the valve should move to the fully open or fully closed position if the operating air supply fails. In many cases, however, it would be safer and the possibility of a plant shut down would be avoided if the valve could revert to its last position after the failure has been corrected.

The Mason Neilan type 76 lock-up valve is designed to revert in this way. The signal connection of this valve is connected to the instrument air supply. Normally the signal pressure underneath



Safety lock-up diaphragm valve



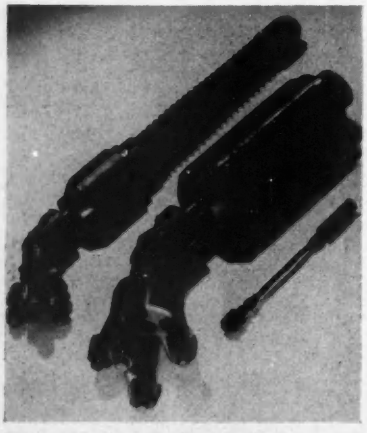
Turbro tank of rigid p.v.c. by Turner and Brown

the diaphragm compresses the spring holding the valve in the open position, enabling the instrument output to pass straight through to the diaphragm.

When the air pressure drops below a predetermined value the spring moves the plug downwards, shutting the valve completely and locking the last instrument output pressure signal in the control valve diaphragm case. Provided the air line connections are tight, it is said the control valve will remain locked in this last position for an indefinite period. Once the air supply is restored, the valve will reopen. The valve may be pre-set to lock at any required air failure pressure within 10–40 p.s.i.

TUBE CLEANING EQUIPMENT

THREE new sizes of vane type motors, operating a variety of cutting heads are now available from Consolidated Pneumatic Tool Co. Ltd., 232 Dawes Road, London SW6, for cleaning straight or curved tubes from 0.495 in. to 6 or more inches internal diameter. Apart from variations of straight and trackless cone cutters, heads which may also be obtained for the 600 series motor, the smallest of the three sizes, are scraper heads (recommended for soft, gummy or oily deposits) and expanding brushes for light deposits. A further head, supplied for service with either the 1300 or 1100 series motor is the H-2, which consists of four sets of rotary cutters carried on arms projecting from a common base. This type is suited to cleaning heavy or uneven deposits in straight tubes and in larger curved tubes and pipes.



Tube cleaning equipment in the new Consolidated Pneumatic Lagonda range

Specialised applications suggested for this equipment include removal of spent catalyst material from reactors and convertors of the tubular type using exhaust air to carry the recovered material to a container, and the cleaning of air preheaters which have become plugged with fly ash.

RIGID REINFORCED TANK

FROM the wire reinforced rigid p.v.c., framed in a mild steel cradle and wrapped with glass fibre bonded with polyester resin, Turner and Brown Ltd., Bolton, are now manufacturing a range of Turbro tanks. These can be made in any size and are said to be resistant to most acids and and alkalis used in industry. The tanks have a coloured pigment incorporated in the glass fibre wrapping, and can be supplied with special covers or 'built in' lip line fume extraction.

SMOKE DENSITY TELESCOPE

THE new Ottway telescope, soon to be on the market, assesses density of smoke and has been recommended by the DSIR Fuel Research Station to local authorities. The Ringelmann chart is the standard laid down by the new Clean Air Act and the 'Telesmoke' affords a portable and visual means of checking the density of smoke from chimneys against the chart. Two filters in the instrument are provided to give shades equivalent to Ringelmann 2 and 3; the shade disc has one-half clear and the other half divided into the two translucent shades. Both screen and smoke are in focus at the same time. The Telesmoke is approximately 1½ in. in diameter and 6 in. long and is produced by W. Ottway and Co., Ltd., Orion Works, Northfield Avenue, London W13.

BLAW KNOX LEVEL INDICATOR

THE Blaw Knox double - diaphgram level indicator has been developed for level control of liquids, powders, granular and flaked materials. It is designed to be unaffected by build-up of air pressure within a silo and to provide level control where pneumatic conveying systems are employed. The indicator is suitable for high and low level control, and comprises two diaphragms arranged vertically, one above the other, coupled by a spring-loaded 'even' beam which is connected to micro-switches. The two micro-switches can be arranged to maintain automatically a pre-determined level of material within a silo, or, alternatively, to actuate audible or visible warning systems.

For extreme conditions, i.e., in high temperatures or when unusual materials are handled, special diaphragms, as well as the ordinary versions, can be supplied by Blaw Knox Ltd., 90-94 Brompton Road, London.

HILGER OPTICAL RESOLVER

THE optical resolver manufactured by Hilger and Watts Ltd., 98 St. Pancras Way, London NW1, works on the following principles:- two circular diffraction gratings are used; one is fixed, and the other attached to a shaft. The angular displacement of the shaft, as it rotates, is measured by counting the moire fringes seen. To distinguish between clockwise and counter-clockwise rotation, the fringes are detected by two photo-transistors so positioned that their approximately sinusoidal outputs are roughly 80 degrees out of phase; a discriminator in the associate circuitry accepts one phase for clockwise counting and the other for counter-clockwise. A third detector gives a 'marker' signal and so provides a reference mark or zero for the scale. Consequently, the optical resolver can be used as a pulse generator and as a direction indicator.

The following advantages are claimed for this resolver: low torque (less than 1 oz./inch); small moment of inertia since the main mass consists only of a thin light glass disc of small diameter; long life since mechanical wear is limited to the shaft ball-bearing surfaces, photo-transistors are almost ageless, and lamps are cheap and easy to replace.

NEW HANDLING EQUIPMENT

Multi-Skip dumper using interchangeable skips for liquids or solids: Thwaites Engineering Co. Ltd., Cubbington, Nr. Leamington Spa.

Load capacity indicator for fork-lift trucks, with dial showing 'safe', 'operate with care' and 'danger' sectors: Lansing Bagnall Ltd., Kingsclere Road, Basingstoke, Hants.

Fork-lift truck with loading capacity of 2 tons, requiring gangways of 7 ft. 6in.: Lansing Bagnall Ltd., (see above).

Drum storage unit (allowing 40/50 gallon steel drums to be stacked in pairs up to five tiers high: Powell and Co., Burry Port, Carms.

Sack tipping unit (the 'Dustmaster') air flow and automatically hinged door for dust control: Dallow Lambert and Co. Ltd., Thurmaston, Leicester.

Automatic barrel lifter for handling 5 cwt. barrels at the rate of up to 250 units per hour; self-adjusting to height of lorry: Industrial Machine and Equipment Co. (Brimpex) Ltd., 41 Murray Road, London SW19.

BAYER LAUNCH FINANCE FIRM TO EXPAND OVERSEAS SALES

PRODUCTIVE capacity of Farbenfabriken Bayer has been raised to an appreciable extent by the large investments made by the company during recent years and in particular the capital expenditure of DM313 million incurred during 1957. This was stated by Professor Dr. U. Haberland, chairman of Bayer, at the company's annual meeting.

Professor Haberland reported that the company would have been very glad if agreements for the establishment of a Free Trade Area could have been completed by now. Bayer were 'firmly convinced' that the Free Trade Area could finally come into being.

Bayer's external business increased by DM257.4 million or 16.1 per cent during the year and reached DM1,853.1 million. Their share in the total turnover of the German chemical industry accordingly rose from 10.5 per cent to 10.9 per cent. Sales on the home market increased by DM134.9 million or 14 per cent and export sales showed an increase of DM122.5 million, or 19.2 per cent, to DM758.8 million and thus reached a ratio of 41 per cent.

Exports to European countries showed a particularly steep increase of DM79.2 million, or 24.5 per cent, bringing Europe's share in the company's export turnover as a whole to 53.4 per cent. Sales to Commonwealth market countries increased by 19 per cent and trade with overseas countries showed a rise of DM44.6 million, or 14.5 per cent.

Capital expenditure incurred by the company and its subsidiaries in 1957 totalled DM313.6 million. Considerable sums were used to strengthen the man-made fibre plants and for modernising the organic dyestuffs plant. The first stage in the construction of the titanium dioxide plant at Uerdingen was completed in Autumn 1957.

Depreciation reached DM190.6 million during the year and covered almost 61 per cent of investment expenditure incurred. Besides investments in the company's oven plants and its subsidiaries, a further appropriation of DM46.7 million was devoted to the expansion of Bayer holdings.

Rapid Development of European Sales

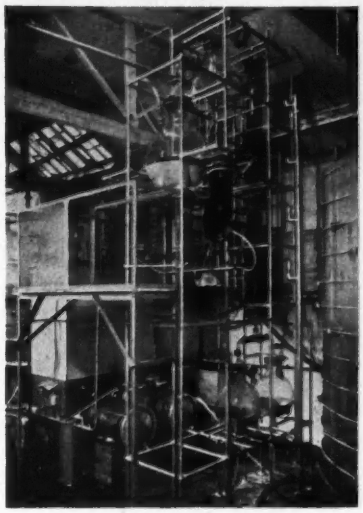
In the increase in business in chemicals during 1957, the home market took up 64 per cent of the turnover as a whole. European sales showed a more rapid development than those in overseas countries. The largest increase registered was in plastics and plastics intermediates. Trade in raw materials for synthetic fibres and for the plastics injection moulding industry developed satisfactorily. Large scale production of polycarbonate is expected to start this year. Production of titanium dioxide began again in the last quarter of 1957, after a lapse lasting 13 years.

Turnover in dyestuffs showed an encouraging increase. This was mainly confined to export markets. Sales of pharmaceutical products achieved an increase of 25 per cent and exports took a larger share in this increase. Pharmaceutical plants in South America were further extended. Trade in the home market and in Europe for plant protection agents and pesticides showed steady development and achieved a further rise of 16 per cent compared with 1956.

Despite severe competitition in man-made fibres, sales achieved a rise of approximately 18 per cent over 1956 sales (cf. 9 per cent achieved by the industry in the Federal Republic). The export ratio rose to 32 per cent. Extended production installations for Perlon continuous filament were fully utilised. Work has begun on increasing capacity for the production of continuous filament.

As Bayer's foreign interests had assumed considerable proportions by 1957, it was decided to set up at the end of the year, Bayer Foreign Investments Ltd., Toronto, Canada, to centralise administration and facilitate provision of finance in foreign capital markets. It is intended to incorporate participations in North, Central and South America as well as in Africa and Western Europe in this organisation during the next few months.

Vinegar Production In All-Glass Still



A new glass vinegar distillation plant, believed to be the largest of its kind in Britain, has been built by Q.V.F. Ltd., of Fenton, Stoke-on-Trent, for the Penistone Pure Malt Vinegar Co. Ltd. The liquor is evaporated and condensed under vacuum and circulated through external heat exchangers in a continuous-feed process, the whole operation being confined within glass containers so that contamination of the acetic vapour by metallic traces is avoided

Hoechst Spend DM 1,000 M. in 5 years

LAST year turnover of Farbwerke Hoechst AG, and associated companies rose by 18.9 per cent to DM1,760 million. The export ratio rose to 32 per cent compared with 30 per cent in the previous year. Of total turnover, 74 per cent went to countries which now form part of the European Common Market.

Capital expenditure in 1957 totalled about DM232 million and brought investments since the company's re-establishment in 1952 to more than DM 1,000 million, financed through depreciation to the extent of 56 per cent. In 1957, the proportion covered by depreciation was 65 per cent. Expenditure on research and development in 1957 was DM88 million. This again represented 5 per cent of the turnover. Expenditure has been largely channelled to extending petrochemical plants, new production plants for basic raw materials and the expansion of fibre and foil production.

Plastics, solvents, lacquer components, fibres and foils accounted for 35 per cent total turnover, with the balance being distributed over dyestuffs, textile auxiliaries and organic intermediates (16 per cent), pharmaceutical products (12 per cent), and inorganic chemicals, fertilisers, plant protection agents, and miscellaneous products (37 per cent).

Production of inorganic chemicals rose considerably as a result of investments previously made. During the current year work has begun on extending installations for the production of chloride and caustic soda. Sales of plant protection agents and of nitrogenous fertilisers, particularly of special complete fertilisers, increased during 1957.

In the plastics field the large-scale low-pressure polythene plant (Hostalen brand) was fully utilised. Of the man-made fibres produced, 'Perlon' capacity was fully utilised and the new polyester fibre Trevira has claimed a large share of the textile market. Pharmaceuticals were also successful, and among special products, aerosols are likely to outstrip sales of refrigerants.

Of the Hoechst associated companies, Knapsack-Griesheim AG, began work on a second 40,000 kw carbide furnace during the year. It is expected that it will be commissioned in the autumn of this year. Use of calcium cyanamide has continued to grow and customers' requirements could not be fully met. Output of phosphorus and phosphates rose considerably. Hoechst's US plant, Hoechst Chemical Corporation, is expanding its production capacity.

The company plans to join Austrian partners in erecting a plant for the production of Hostalen, near Vienna. Polymerisation plants in other countries are either being built or planned.

People in the NEWS

● THE EARL OF HALSBURY is to retire from the £5,000-a-year managing directorship of the National Research Development Corporation Ltd., on 31 March 1959. He is to take up another appointment in the field of industrial science, details of which are to be announced in due course. Lord Halsbury was appointed temporary adviser to the Board of Trade in May 1949, in anticipation of the establishment of the Corporation under the Development of Inventions Act, 1948, and became the first managing director of NRDC in June 1949. He was responsible for launching and building up this experimental market in 'back-room brains', and by next March will have directed its activities for nearly ten years. A successor has not yet been appointed.

● DR. J. C. SWALLOW, Ph.D., B.Sc., A.M.I.Chem.E., F.R.I.C., F.P.I., chairman of the ICI Plastics Division, has been re-elected president of the Plastics Institute, while his colleague, MR. J. V. CROSSLEY, M.Sc., F.P.I., divisional home sales director, is also to serve a second term as chairman of the council. MR. A. W. SHERWOOD, F.P.I., sales promotion executive of Bakelite Ltd., starts his 27th year as hon. treasurer, and MR. J. TAYLOR, B.Sc., F.R.I.C., F.P.I., his 5th as hon. general secretary. Other members of the council elected were DR. C. L. CHILD, B.Sc., Ph.D., MR. J. M. CLARKE, A.C.A., MR. R. L. DOUGLAS, B.A., B.Sc., A.R.I.C., and MR. C. W. WELCH.

Dr. J. C. Swallow

● MR. B. CURTIS, senior engineer, water separator division, Simmonds Aerocessories Ltd., is visiting Turkey and Iran this month to establish direct links with the national oil companies in those countries and to give technical advice on problems connected with water separation. Mr. Curtis will also visit his company's other agents and customers.

● MR. E. A. SWINTON, a senior research officer of the division of industrial chemistry, Commonwealth Scientific and Industrial Research Organisation, Australia, arrived in the UK on 21 July to study methods of water desalination by distillation and freezing processes.

● MR. D. I. LAWSON, M.Sc., F.Inst.P., M.I.E.E., has been appointed director of fire research of the Joint Fire Research Organisation of the DSIR and the Fire Offices' Committee whose Fire Research Station is at Boreham Wood, Herts. Since 1952 he has been assistant director to MR. S. H. CLARKE, C.B.E., who has been put in charge of DSIR's Warren Spring Laboratory (CHEMICAL AGE, 12 July, p. 77). Mr. Lawson took First-Class Honours in Physics with Mathematics at Manchester University and gained a M.Sc. degree for research in X-ray crystallography. After lecturing at Woolwich Polytechnic, he became head of the research division at Pye Ltd., of Cambridge.

● DR. J. B. HIGHAM has been appointed to the new post of head of technical development of Pilkington Brothers Ltd. He will be responsible for the creation of a centralised department to co-ordinate and expand technical development in all the works of the company.

● DR. P. L. CLEGG, B.Sc., Ph.D., has been awarded the Silver Medal of the Plastics Institute for his paper on 'The flow properties of polyethylene and their effect on fabrication', which was published in the *Transactions* of the Institute last April.

● MR. OWEN BROOKS has been appointed sales representative for Scotland and parts of Northern England by Stanton Instruments Ltd., 119 Oxford Street, London W1. Since 1942 Mr. Brooks has worked as a laboratory assistant at the University of Glasgow, the Royal Technical College, Glasgow, and at Columbia University, New York.

● MR. J. STRONG, an executive director of British Oxygen Co., has been elected president of the Institute of Welding for 1958-59 in succession to Sir Charles Lillicrap.

● The Textile Institute has conferred hon. membership on MR. F. L. BARRETT, of the Bleachers' Association Research Laboratories, Bromley Cross, near Bolton.

● MR. W. J. WAKELING has just retired from 59 years' service with Johnsen and Jorgensen Flint Glass Ltd. MR. S. J. FEHLER succeeds him as manager of one of the glass bottle departments.

● MR. P. S. BEALE, formerly chief cashier of the Bank of England, has joined the board of the British Oxygen Co. Ltd.

● MR. W. PROUDFOOT, M.A., has been appointed Manchester area representative for West Instrument Ltd. He has been engaged on instrument development and plant investigation with the Distillers Co. Ltd., at the British Industrial Solvents Division, and subsequently as assistant development manager with the Tootal Ltd. subsidiary of John Watton of Glossop.

● MR. R. J. BARRITT has been appointed chief executive, engineering division, the British Oxygen Co. Ltd., from 1 September.

● DR. FRANCIS AYLWARD, head of the Department of Chemistry and Food Technology at the Borough Polytechnic, London SE1, has been awarded a D.Sc. by the University of Liverpool.

● DR. P. M. G. BAVIN., B.Sc., Ph.D. (Lond.) has been appointed ICI research fellow in the department of chemistry, Hull University, with effect from the start of the new session. Other new appointments in the department are: research fellows, MR. D. BOOTH, B.Sc. (Leeds) and DR. J. PARRICK, B.Sc., Ph.D. (Nott.); research assistant, MR. J. N. SHERWOOD, B.Sc. (Dunelm); demonstrator, MR. K. J. TOYNE, B.Sc. (Man.).

● DR. W. ANGUS MACFARLANE, recently appointed director of the National Industrial Fuel Efficiency Service by the British Productivity Council, has now been appointed managing director of the service by the NIFES board of directors. Prior to joining NIFES in 1954 Dr. Macfarlane was scientific attaché at the British Embassy and head of the UK mission in Washington.

● DR. W. F. WATSON has been appointed director of research by the Research Association of British Rubber Manufacturers in succession to DR. J. R. SCOTT, who has been director since 1940. Dr. Watson, who was a D.Sc. at 26, will be one of the youngest directors of research at the present time. He was one of the pioneer students working on polymer research under Professor (now Sir Harry) Melville and then studied the optical properties of chlorophyll for two years with a post-doctorate fellowship at the University of Minnesota. At the British Rubber Producers' Research Association, Dr. Watson has carried out the classical researches to explain how rubber and other polymers are softened by mechanical treatment, and has also continued, among other studies, theoretical work on the chain-length distribution of polymers.

Dr. W. F. Watson

Obituary

MR. HENRY ELLISON, founder and chairman of Yorkshire Tar Distillers Ltd., died at his home at Calverley, near Bradford, Yorks, last week at the age of 86. Mr. Ellison, who was chairman and managing director of James Wilkinson and Son, Ltd., Sheffield, was also associated with the Sheffield Chemical Co. Ltd., the Kilgerm Co. Ltd., and the Mirvale Chemical Co. Ltd.

Commercial News

- British Oxygen Pay Unchanged Interim
- Distillers Pay More on Higher Profit
- SAI Report Increased Sales and Profit
- £1 Million Loan to Fisons of South Africa

British Oxygen

An unchanged interim dividend of 4 per cent in respect of the year to 30 September 1958, is announced by British Oxygen Co. Ltd. The directors state that although the results for the first year are satisfactory and encouraging, in view of circumstances, national and international, they feel it prudent to reserve for further consideration the question of an increase in dividend until the end of the year. A final of 6 per cent made a total of 10 per cent on the £17,047,166 ordinary for 1956-57.

Commercial Plastics

Increased profits for the year to 31 March 1958, and a two-for-one scrip issue, capitalising £925,000 of the share premium account, have been announced by Commercial Plastics Ltd.

Group trading profit increased from £419,811 to £708,149 and the net profit from £149,742 to £278,240. Taxation was £279,946 (£162,320) and depreciation etc. £156,301 as against £108,644.

Final ordinary dividend is 27½ per cent on the £462,500 capital, making with the 15 per cent, interim on £307,500, a total of 42½ per cent.

Commercial Plastics have taken over a 250,000 square-foot factory at the West Chirton trading estate, North Shields and is intending to instal a new plant for an extended range of products. The company processes about 300,000 lb. of p.v.c. raw material, mainly granular plastics, on behalf of the four companies operating at the Wallsend-on-Tyne factory. Polythene film and polystyrene sheet are handled by subsidiary companies.

Distillers Co. Ltd.

Group trading profits of the Distillers Co. Ltd., rose by over £1.4 million to £24,800,254 for the year to 31 March last, and the total ordinary dividend is increased by 1½ per cent to 20 per cent.

Final payment will be 12½ per cent against 12½ per cent, following an increase in the interim from 6 to 7½ per cent.

Income from trade investments was higher at £1,517,734, compared with £1,259,306 after all charges, including tax and minority interests, net profit attributable to the company is up from £9,817,587 to £10,582,818.

Murex Ltd.

Group profit of Murex Ltd. fell from £1,021,000 to £983,000, and the net profit is £61,000 down at £291,000. The final dividend is being reduced from 12½ per cent to 10 per cent, making 17½ per cent on the £2.2 million capital for the year to 30 April 1958, compared with 20 per cent for 1956–57.

The fall during the year in the world prices of certain essential raw materials, principally wolfram ore, resulted in further substantial stock losses. Overall demand for the metallurgical products of the parent company suffered a sharp decline in the period January to April 1958 which was accentuated by customers stock reductions. Trading profits of the last four months of the year were 'substantially' below those of the preceding eight months.

Expenditure during the year was again at a high level. To conserve cash resources, however, it was decided to defer certain items included in the capital programme. Modifications to the proposals for raising additional capital outlined in the interim dividend announcement last December (unsecured loan stock issue not exceeding £1.3 million), are under consideration and will be dealt with more fully in the directors' report, due out by September.

Scottish Agricultural Industries

Sales of fertilisers by Scottish Agricultural Industries during the eight months ended 31 May 1958, were higher than in the corresponding period of the previous year due, it is stated, to the successful operation of the new Leith works. Unaudited figures for the eight months show sales of £18.2 million, compared with £17.9 million and profits, before tax, of £1,197,000, against £756,000.

The eight months' profit for 1957 were materially reduced by losses incurred on realisation of stocks following disposal of interests in the agricultural implement business. However, 1958 profits have benefited from the delay in effecting deliveries of fertilisers during the summer of 1957, pending full operation of the new Leith plant.

SAI are maintaining the interim dividend at 3 per cent for the year to 30 September 1958. The 1956–57 total was 8 per cent.

Yorkshire Dyeware

Another favourable year is reported by Yorkshire Dyeware and Chemical Co. Ltd., trading profit being £408,744 compared with £347,602 for the previous 12 months. Taxation was heavier at £171,882 against a previous sum of £147,011. Net profit after other charges is £127,957 compared with £118,429. Payment of a final dividend of 10 per cent on ordinary is being made, making 15 per cent for the year, together with a bonus of 5 per cent which with the interim dividend of 5 per cent makes a total of 20 per cent.

In his report chairman Mr. F. A. Helme notes the somewhat quieter conditions towards the end of the year following some recession in the textile industry. He referred also to the company ceasing to manufacture vegetable tannin extracts. This decision will enable the company to concentrate more on synthetic tannins, chrome liquors and dyestuffs. Activities in commercial adhesives have shown continued growth and new plant is now in production.

Much rebuilding has been carried out at the company's various works, new laboratories have been established and research facilities extended. The Australian subsidiary has also had a very good year and is now well established in its new premises.

United Gas Industries

Final ordinary dividend of United Gas Industries is cut from 10½ per cent to 8¾ per cent, making 12½ per cent for the year to 31 March 1958, against 14 per cent previously. Deferred dividend is also lowered from 112½ per cent to 70⅝ per cent.

Group net profits were £109,241 (£127,516).

Fisons (Pty) S. Africa

An agreement has been signed by Commonwealth Development Finance Co. for an 18-year loan of £1 million to Fisons (Pty.) of Durban, South Africa, which was agreed in principle some time ago. The money will help to finance Fison's factory now under construction at Sasolburg, Orange Free State, to make sulphuric acid, superphosphates and compound fertilisers.

Fisons (Pty.) are the joint owned company of Fisons Ltd. of Suffolk and NV Albatros Superfosfaatfabrieken, of Utrecht, Holland. Compound fertilisers have been made by the company since 1924 at two factories, one at Durban and the other at Kuils River, Cape Province.

Reichold Dividends

Reichhold Chemicals have declared a cash dividend of 25 cents and a stock dividend of 2 per cent, payable 15 August, following 20 cents cash and 2 per cent in stock in February and May this year.

Sandoz Ltd.

Higher demand for Sandoz products resulted in a 10 per cent increase of the total turnover compared with that of 8.5 per cent in 1956. The company's world turnover amounted to Sw. Frs. 488 million, and was the highest figure ever reached.

Shares of the three divisions in the total turnover were approximately the same as in the previous year, i.e. pharmaceuticals 41.7 per cent, dyestuffs 38.8 per cent and chemicals 19.6 per cent. Of the company's total turnover, 47 per cent was effected in countries of the European

Common Market and within the proposed Free Trade Area.

In the chemicals division, sales continued to rise during the year under review and reached a peak of Sw. Frs. 96 million. The increase in turnover amounted to 2.7 per cent.

The favourable trading situation in dyestuffs continued in 1957 in most sections of the textile industry, but in the second and third quarter of the year there were marked signs of a recession in several countries. However, demand caused the company's sales to reach record figures in both quantity and value. Turnover at Sw. Frs. 189 million was 10.4 per cent higher than in 1956. Exports to countries in Western Europe showed a gratifying increase. There was also an upward trend in most of the markets in Asia.

Great efforts had to be made in the pharmaceuticals division to keep production abreast of the growing demand. Sales of pharmaceuticals reached a total turnover of Sw. Frs. 203 million, and showed an increase of Sw. Frs. 25.5 million (14.3 per cent) over 1956.

Expenditure on research at Sw. Frs. 22.6 million showed a considerable increase over the previous year's figure and reflects the expansion of laboratories.

In Milan, the Italian company showed a considerable increase in turnover, and a new plant is being built at Incirano, for the manufacture of chemicals and for storage of chemicals and dyestuffs.

Sandoz Products (Private) Ltd., India, have started work on the first stage of their building programme. The installations will be used for the production of basic pharmaceuticals and chemicals as well as for mixing dyestuffs.

A net profit of Sw. Frs. 16,588,193.48 is shown in the accounts, an increase of Sw. Frs. 208,522.39 over 1956. Gross profit totalled Sw. Frs. 52,069,481.91 an increase of Sw. Frs. 561,803.52. The board propose to pay a dividend of Sw. Frs. 100 on 100,000 shares.

Dynamit Nobel

Dynamit Nobel of Germany, manufacturers of plastics and chemicals, are distributing a dividend for 1957 of 12 per cent (same). Net profit for the year is DM 5.7 million (DM 5.2 million)

NEW COMPANIES

CHROMATOSCIENCE LTD. Cap. £100. Research and development technicians, engineers and scientists, manufacturers of and retailers of scientific apparatus, etc. Directors: Dr. I. Smith and Mrs. M. J. Smith. Reg. office: 15 Hanover Square, London W1.

LINCOLN CHEMICALS LTD. Registered 2 May. Capital £100 in £1 shares. Objects: to carry on the business of manufacturing consulting and research chemists and makers of chemical products, etc. Registered office: Victoria House, Southampton Row, London WC1.

STARCH CONVERSIONS LTD. Cap. £1,000. Manufacturers of and dealers in chemicals, chemical products, deodorants, disinfectants, etc. Reg. office: Leyland Mills, Leyland Mill Lane, Marylebone, Wigan.

TRADE NOTES

Empilan MAA and MAB

Two additions to the Empilan range of Marchon Products Ltd., Whitehaven, Cumberland, are Empilan MAA and MAB. These are cream-coloured pastes, for incorporating in liquid detergent formulations, which do not effect the pH of the finished formulation and are completely soluble, the makers claim, in solutions of anionic and non-ionic surfactants. Empilan MAA and MAB are incorporated by dissolving in an aqueous solution of the active constituent at 50°C and adding the balance of water and/or solvent when all the additive is dissolved.

Helmets Now Tax Free

The Finance Bill has been amended so as to make helmets that are designed to protect the head from injury not liable to purchase tax as from 17 July. This relief applies to protective helmets fitted with an inner cradle.

Helical Potentiometers

The first products of the factory now being completed at the new Fife town of Glenrothes for Beckman Instruments, Ltd., UK subsidiary of Beckman Instruments, Inc., for whom Winston Electronics, Ltd., Shepperton, Middx. are the sole UK distributors, will be Helipots (helical potentiometers).

New Fielden Midland Office

Fielden Electronics Ltd. have set up a permanent Midland area office in Walsall at 51 Bradford Street (Arboretum 55343). The new office is under the management of Mr. F. Bernard Price.

Strong Disinfectant

A disinfectant with a floral perfume introduced by Teals of Ipswich has been determined as having a Rideal-Walker co-efficient of four to five, which would mean that the product is four to five times stronger than carbolic acid. The disinfectant is called 'Garland' and is claimed to be non-toxic and non-corrosive and will not harm hands or any other form of living tissue.

Changes of Address

Evode Ltd. are moving their London Office to 82, Victoria Street, London SW1 (Tel: ABBey 4622). The new offices are adequate to house the two associates, Evomastics Ltd. and English Waxes Ltd. The company's head office remains at Stafford.

From 11 August the administrative offices of Kelvin and Hughes (Industrial) Ltd. will move from 2 Caxton Street, Westminster, London SW1, to their new building at Empire Way, Wembley, Middx. (Tel: 8888).

Acheson Colloids to Move

Acheson Colloids Ltd. are to move their headquarters to National Provincial Bank Chambers, St. Andrew's Cross, Plymouth. Various departments, including the main sales department, will be located at the new building, and from 28 July all correspondence, orders, invoices, etc., should be addressed to the firm at PO Box 12, Plymouth, Devon. The company's branch sales offices at Richmond (London), Rochdale and Birmingham will still be available to provide all sales and advisory services. The move is part of Acheson Industries (Europe) Ltd. decentralisation programme, designed to enable the units to cope with increased UK sales.

Protecting Granolithic Floors

Hexmetal cellular reinforcement has been introduced by Causeway Reinforcement Ltd., 66 Victoria Street, London SW1 (one of the Amber group), to prevent cracking and spalling at the edges of sections of granolithic floors. Hexmetal mesh, with a mesh size of 2-in. A/f by 1-in. deep by 14G, fabricated in 4-in. wide strips, can be inset along either side of the joint. The joints are infilled with mastic asphalt or bitumen in the line of the hexagons formed by the two abutting strips, thus allowing for movement between the two slabs.

Sodium Methoxide Distributors

Sole distributors for Great Britain for sodium methoxide and other alcoholates manufactured by Feldmuhle AG, of West Germany, are Tar Residuals Ltd.

Further Platinum Price Reduction

Baker Platinum have announced that as from 22 July, their price for platinum in the UK will be £23 5s per troy ounce. The price quoted up to the above mentioned date was £25 per troy ounce.

Demand for platinum is still slack due to producers having overestimated the requirements of the oil industry. The current price of the metal (much of it of Russian origin) obtained through the dealer trade is £20 to £21 per troy ounce.

Emulsion Paint

PLEC, based on polyvinyl acetate and copolymers, is a new emulsion paint produced by Corrosion Ltd., Southampton. The material conforms to all existing specifications, including the new definition laid down in the Factories (Cleanliness of Walls and Ceilings) Order 1958. It is offered at 25s per gall. in 1-gallon cans, and is available in 15 pastel colours.

Ammonium Sulphate Duty Under Review

A REQUEST from users that the import duty on sulphate of ammonia should be removed is being considered by the Board of Trade, the Parliamentary Secretary stated in the House of Commons on Tuesday.

Clean Air Conference

The National Society for Clean Air will this year hold its conference in Llandudno from 1 to 3 October. Speakers will include the Minister of Housing and Local Government, who is also chairman of the Clean Air Council, and Sir William Holford, professor of town planning at London University, who will give the Des Voeux Memorial Lecture.

NEW PATENTS

By permission of the Controller, HM Stationery Office, the following extracts are reproduced from the 'Official Journal (Patents)', which is available from the Patent Office (Sale Branch), 25 Southampton Buildings, Chancery Lane, London WC2, price 3s. 3d. including postage; annual subscription £8 2s.

Specifications filed in connection with the acceptances in the following list will be open to public inspection on the dates shown. Opposition to the grant of a patent on any of the applications listed may be lodged by filing patents form 12 at any time within the prescribed period.

ACCEPTANCES

Open to public inspection 20 August

Isonicotinic thiomides, process of preparation. Chimie et Atomistique. **800 250**
Sampling method and apparatus. Du Pont De Nemours & Co., E. I. **800 139**
Continuous extraction presses. Diefenbach, G. **800 268**
Separation of solid materials having different specific gravities in a liquid suspension of comminuted solids. Tromp, K. F. **800 020**
Apparatus for storing liquefied gases. Constock Liquid Methane Corp. **800 008**

Open to public inspection on 27 August

Concentration of plutonium. Seaborg, G. T., and Brown, H. S. **800 377**
Extracting uranium from its ores. UK Atomic Enery Authority. **800 629**
Fuel elements for nuclear reactors. UK Atomic Energy Authority. **800 629**
Manufacturing lengths of synthetic plastic material. Siemens Edison Swan, Ltd. **800 451**
Chlorination processes involving sulphuryl chloride. Coalite & Chemical Products, Ltd., Bondy, H. F., and Marshall, R. P. **800 630**
Recovery of solvents from mixtures containing them by multi-stage evaporation. Edeleanu G.m.b.H. **800 424**
Derivatives of phenthiazine and processes for their production. Soc. des Usines Chimiques Rhone-Poulenc. **800 632**
Manufacture of catalysts. Oxy-Catalyst, Inc. **800 338**
Filters and filtering media for liquids. British Filters, Ltd., and Pritchett & Gold & E.P.S. Co., Ltd. **800 681**
Producing or stripping dyeings. Ciba Ltd. **800 401**
Apparatus for use in blending or mixing operations. Price & Sons, Ltd., W. [Addition to 739 374.] **800 473**
Catalytic reforming. Socony-Mobil Oil Co., Inc. **800 339**
Shaping of foamed polyurethane materials. Schickedanz, G. [trading as Vereinigte Papierwerke Schickedanz & Co.]. **800 474**
Forming wear-resistant surfaces on workpieces of non-magnetisable steel. Böhler & Co. AG., Geb. **800 604**
Separating and purifying zirconium and hafnium. Commissariat à L'Energie Atomique. **800 426**
Process and apparatus for effecting nuclear fission reactions. Stichting Reactor Centrum Nederland. **800 526**
Treatment of gases containing ethylene. Ruhrchemie AG. **800 320**
Preparation of ferrous sulphate suspensions. British Titan Products Co., Ltd. **800 410**
Preparation of collagenous material. Ethicon, Inc. **800 475**
Apparatus for the gasification of finely divided fuels. Koppers G.m.b.H., H. **800 409**
Preparation of 2-keto-*l*-gulonic acid. Pfizer & Co., Inc., C. **800 634**
Insecticides. Escobar, J.N. **800 411**
Catalytic reforming of petroleum hydrocarbons. British Petroleum Co., Ltd., and Moy, J. A. E. **800 430**
Catalytic reforming of petroleum hydrocarbons. British Petroleum Co., Ltd., and Cuddington, K. S. **800 431**
Heating and reheating of ferrous metals. Metallurgical Oxygen Processes, Ltd. [Addition to 606 401.] **800 381**
Elastomers and additives therefor. Imperial Chemical Industries, Ltd. **800 554**
Process and apparatus for producing bonded fibrous glass. Owens-Corning Fiberglas Corp. **800 477**
Formation of alkali-soluble cellulose ethers. Londat Aetz Fabric Co. **800 478**
Derivatives of phenthiazine and processes for their production. Soc. des Usines Chimiques Rhone-Poulenc. [Divided out of 800 632.] **800 635**
Compositions for treating glass surfaces and glass when so treated. Owens-Corning Fiberglas Corp. **800 518**
Compositions for use in coating compositions. Commonwealth Engineering Co. of Ohio. **800 481**
Lacquers on the basis of epoxy resins. Badische Anilin- & Soda-Fabrik AG. **800 482**
Removing water from finely divided granular materials of high water content, and apparatus for effecting separation of liquid-solid and solid-solid mixtures. Halstrick, H. **800 355**
Process for colouring aromatic polyester fibres. Imperial Chemical Industries, Ltd. **800 606**
Granular mixed fertilisers. Imperial Chemical Industries, Ltd. **800 438**
Manufacturing non-conglomerating ammonium sulphate and products resulting therefrom. Soc. Carbochimique Soc. Anon. **800 483**
Mercaptomethyl dialkyl dithiophosphates and insecticidal compositions. Stauffer Chemical Co. **800 416**
Producing fertilisers. Lummus Co. **800 417**
Quaternary derivatives of aminoalkyl esters of organic acids, and processes for preparation. Boehringer, A., Boehringer, E., Liebrecht, I., Liebrecht, J., and List, W. Mayer- [trading as Boehringer Sohn, C. H.]. **800 667**
Preparation of alkyls of lead and aluminium. Esso Research & Engineering Co. **800 609**
Method for the reduction of oxidic iron ores. Ateliers Des Charmilles Soc. Anon. **800 612**
Condensing of zinc in liquid foam from zinc vapour. National Smelting Co., Ltd. **800 586**
Manufacture of blasting explosives. Imperial Chemical Industries, Ltd. **800 442**
Manufacture of cation-exchangers of the polystyrene-type. Mühlberg, W. **800 639**
Phosphoric esters of dextran and salts thereof. Soc. Farmaceutici Italia **800 484**
Preparation of aluminium sesquichlorides. Distillers Co., Ltd. **800 615**
Steroids and the manufacture thereof. Up-John Co. **800 640**
Preparation of dialkali derivatives of dimerised aliphatic conjugated olefins or dimerised vinyl aromatic hydrocarbons and their conversion into dicarboxylic acids. National Distillers & Chemical Corporation. **800 614**
Plasticised and heat and light stabilised polymeric compositions. Union Carbide Corp. **800 309**
Fluid bed roasting of zinc ores. New Jersey Zinc Co. **800 643**
Production of a urea melt poor in biuret. Badische Anilin- & Soda-Fabrik AG. **800 446**
Organo-titanium and zirconium compounds. National Lead Co. **800 528**
Propylene polymerisation. Esso Research & Engineering Co. **800 447**
Melting of metals and apparatus therefor. Du Pont de Nemours & Co., E. I. **800 510**
Steroid compounds and the preparation thereof. Pfizer & Co., Inc., C. **800 644**
Method for the powder metallurgical manufacture of chromium alloys. Wargöns Aktiebolag. **800 343**
Steroids and the manufacture thereof. Upjohn Co. **800 645**
Treatment of catalyst materials used to dehydrogenate unsaturated hydrocarbons with high energy radiations. Dow Chemical Co. **800 563**
Condenser for gaseous fluids which condense to the solid state. Aluminium Laboratories, Ltd. **800 486**
Manufacture of fuel elements for nuclear reactors. Deutsche Gold- Und Silber-Schneideanstalt Vorm Roessler. **800 420**
Production of stretched thermoplastic film. Du Pont de Nemours & Co., E. I. **800 646**
Methods of treating ores or concentrates containing iron sulphide. Pyror, Ltd. **800 647**
Producing N-alkyl-piperidine α-carboxylic acid amides and N-alkyl-pyrrolidine-α carboxylic acid amides. Bofors Aktiebolaget. **800 670**
Producing N-alkyl-piperidine- -monocarboxylic acid amides and N-alkyl-pyrrolidine-α -monocarboxylic acid amides. Bofors Aktiebolaget. **800 565**
Solvent-cutback, hard film rust preventative. Esso Research & Engineering Co. **800 590**
Preparation of 2-phenyl-1, 3-propanediol dicarbamate. Carter Products, Inc. **800 619**
Production of metals by reduction. Deutsche Gold- Und Silber-Scheideanstalt Vorm. Roessler. **800 689**
Cyclohexenone derivatives. Soc. des Usines Chimiques Rhone-Poulenc. **800 649**
Azobenzene derivative and the manufacture and conversion thereof. Hoffmann-la Roche & Co., AG. **800 489**
Insecticidal compositions. Israel, Represented by the Prime Minister's Office, State of, and Neeman, M. **800 490**

Procedure for Exemption from Import Duty

THE Safeguarding of Industries Act, 1921, having been repealed, all articles formerly chargeable with Key Industry Duty will from 1 January 1959, become chargeable with import duty under the Import Duties Act, 1958.

The temporary exemption of such articles from duty in certain circumstances is provided for in this Act, and the Board of Trade are now considering what articles shall be exempt from duty for a period from 1 January 1959 to 30 June or 30 September 1959, as appropriate. Lists of chemicals now exempt from KID were published in Statutory Instruments, 1958, Nos. 204, 734 and 975.

Consideration will be given to the exemption from duty of only those articles in respect of which specific requests are received. Requests for exemption and requests for further details of the exemption procedure under the Import Duties Act should be sent to the Tariff Division, BoT, Horse Guards Avenue, London SW1, before 15 August.

BRITISH CHEMICAL PRICES

GENERAL CHEMICALS

Acetic Acid. D/d in ret. barrels (tech. acid barrels free); in glass carboys, £8; demijohns, £12 extra. 80% tech., 10 tons, £97; 80% pure, 10 tons, £103; commercial glacial, 10 tons, £106.

Acetic Anhydride. Ton lots d/d, £136.

Alum, Ground, f.o.r., about £25.
MANCHESTER: Ground, £25.

Aluminium Sulphate. Ex-works, d/d, £15 10s to £18.
MANCHESTER: £16 to £18.

Ammonia, Anhydrous. Per lb., 1s 9d-2s 3d.

Ammonium Chloride. Per ton lot, in non-ret. pack, £27 to £30 2s 6d.

Ammonium Nitrate. D/d, 4-ton lots, £31.

Ammonium Persulphate. Per cwt., in 1-cwt. lots, d/d, £6 13s 6d; per ton, in min. 1-ton lots, d/d, £123 10s.

Ammonium Phosphate. Mono-and di-, ton lots, d/d, £106 and £97 10s.

Antimony Sulphide. Per lb., d/d UK in min. 1-ton lots: crimson, 4s 7d to 5s 0½d; golden, 2s 10½d to 4s 3½d.

Arsenic. Ex-store, £45 to £50.

Barium Carbonate. Precip., d/d, 4-ton lots, bag packing, £41.

Barium Chloride. 2-ton lots, £49.

Barium Sulphate [Dry Blanc Fixe]. Precip. 2-ton lots, d/d, £43.

Bleaching Powder. Ret. casks, c.p. station, in 4-ton lots. £30 7s 6d.

Borax. Ton lots, in hessian sacks, c.p. Tech., anhydrous, £68; gran., £46; crystal, £48 10s; powder, £49 10s; extra fine powder, £50 10s; BP, gran., £55 10s; crystal, £57 10s; powder, £58 10s; extra fine powder, £59 10s. Most grades in 6-ply paper bags, £1 less.

Boric Acid. Ton lots, in hessian sacks, c.p. Tech., gran., £76 10s; crystal, £84 10s; powder, £82; extra fine powder, £84; BP gran., £89 10s; crystal, £96 10s; powder, £94; extra fine powder, £96. Most grades in 6-ply paper bags, £1 less.

Calcium Chloride. Ton lots, in non-ret. pack: solid and flake, about £15.

Chlorine, Liquid. In ret. 16-17-cwt. drums d/d in 3-drum lots, £40.

Chromic Acid. Less 2½%, d/d UK, in 1-ton lots, per lb., 2s 2½d.

Chromium Sulphate, Basic. Crystals, d/d, per lb., 8½d; per ton, £79 6s 8d.

Citric Acid. 1-cwt. lots, per cwt., £11 5s.

Cobalt Oxide. Black, per lb., d/d, bulk quantities, 13s 2d.

Copper Carbonate. Per lb., 2s 9d.

Copper Sulphate. F.o.b., less 2% in 2-cwt. bags, £70.

Cream of Tartar. 100%, per cwt., about £11 12s.

Formaldehyde. In casks, d/d, £39 10s.

Formic Acid. 85%, in 4-ton lots, c.p., £89.

Glycerine. Chem. pure, double distilled 1,260 s.g., per cwt., in 5-cwt. drums for annual purchases of over 5-ton lots and under 25 tons, £10 1s 6d. Refined pale straw industrial, 5s per cwt. less than chem. pure.

Hydrochloric Acid. Spot, per carboy, d/d (according to purity, strength and locality), about 12s.

Hydrofluoric Acid. 60%, per lb., about 1s 2d.

Hydrogen Peroxide. Carboys extra and ret. 27.5% wt., £128 10s; 35% wt., d/d, £158.

Iodine. Resublimed BP, under 1 cwt., per lb., 14s 1d; for 1-cwt. lots, per lb., 13s 2d.

Iodoform. Under 1 cwt., per lb., £1 2s 4d, for 1-cwt. lots, per lb., £1 1s 8d.

These prices are checked with the manufacturers, but in many cases there are variations according to quality, quantity, place of delivery, etc.

Abbreviations: d/d, delivered; c.p., carriage paid; ret., returnable; non-ret. pack., non-returnable packaging; tech., technical; comm., commercial; gran., granular.

All prices per ton unless otherwise stated

Lactic Acid. Pale tech., 44% by wt., per lb., 14d; dark tech., 44% by wt., per lb., 9d; chem. quality, 44% by wt., per lb., 12½d; 1-ton lots, ex-works, usual container terms.

Lead Acetate. White, about £154.

Lead Nitrate. 1-ton lots, about £135.

Lead, Red. Basis prices: Genuine dry red, £104 5s; orange lead, £116 5s. Ground in oil: red, £125 5s, orange, £137 5s.

Lead, White. Basis prices: Dry English in 5-cwt. casks, £116; Ground in oil: English, 1-cwt. lots, per cwt., 194s.

Lime Acetate. Brown, ton lots, d/d, £40; grey, 80-82%, ton lots, d/d, £45.

Litharge. In 5-ton lots, £106 5s.

Magnesite. Calcined, in bags, ex-works, about £21.

Magnesium Carbonate. Light, comm., d/d, 2-ton lots, £84 10s under 2 tons, £97.

Magnesium Chloride. Solid (ex-wharf), £17 10s.

Magnesium Oxide. Light, comm., d/d, under 1-ton lots, £245.

Magnesium Sulphate. Crystals, £16.

Mercuric Chloride. Tech. powder, per lb., for 5-cwt. lots, in 28-lb. parcels, £1 1s 9d; smaller quantities dearer.

Mercury Sulphide, Red. 5-cwt. lots in 28-lb. parcels, per lb., £1 10s 6d.

Nickel Sulphate. D/d, buyers UK, nominal, £170.

Nitric Acid. 80° Tw., £35.

Oxalic Acid. Home manufacture, min. 4-ton lots, in 5-cwt. casks, c.p., about £129.

Phosphoric Acid. Tech. (s.g. 1.700) ton lots, c.p., £100; BP (s.g. 1.750), ton lots, c.p., per lb. 1s 4d.

Potash, Caustic. Solid, 1-ton lots, £95 10s; liquid, £36 15s.

Potassium Carbonate. Calcined, 96/98%, 1-ton lots, ex-store, about £74 10s.

Potassium Chloride. Industrial, 96%, 1-ton lots, about £24.

Potassium Dichromate. Crystals and gran., per lb., in 5-cwt. to 1-ton lots, d/d UK, 1s 2½d.

Potassium Iodide. BP, under 1-cwt., per lb., 8s. 6d.; per lb. for 1-cwt. lots, 8s 3d.

Potassium Nitrate. 4-ton lots, in non-ret. pack, c.p., £63 10s.

Potassium Permanganate. BP, 1-cwt. lots, per lb., 1s 11½d; 3-cwt. lots, per lb., 1s 10¾d; 5-cwt. lots, per lb., 1s 10½d; 1-ton lots, per lb., 1s 10d; 5-ton lots, per lb., 1s 9½d. Tech., 5-cwt. in 1-cwt. drums, per cwt., £9 15s 6d; 1-cwt. lots, £10 4s 6d.

Salammoniac. Ton lot, in non-ret. pack, £47 10s.

Salicylic Acid. MANCHESTER: Tech., d/d, per lb., 2s 4d.. 1-ton lots.

Soda Ash. 58% ex-depot or d/d, London station, 1-ton lots, about £17 3s.

Soda, Caustic. Solid 76/77%: spot, d/d 1-ton lots, £33 16s 6d.

Sodium Acetate. Comm. crystals, d/d, £91.

Sodium Bicarbonate. Ton lot, in non-ret. pack., £16 10s.

Sodium Bisulphite. Powder, 60/62%, d/d 2-ton lots for home trade, £46 2s 6d.

Sodium Carbonate Monohydrate. Ton lot, in non-ret. pack, c.p., £57.

Sodium Chlorate. 1-cwt. drums, c.p. station, in 4-ton lots, about £88 10s.

Sodium Cyanide. 96/98%, ton lot in 1-cwt. drums, £113 5s.

Sodium Dichromate. Crystals, cake and powder, per lb., 1s. Net d/d UK, anhydrous, per lb., 1s 1½d. Net. del. d/d UK, 5-cwt. to 1-ton lots.

Sodium Fluoride. D/d, 1-ton lots and over, per cwt., £5; 1-cwt. lots, per cwt., £5 10s.

Sodium Hyposulphite. Pea crystals, £38; comm., 1-ton lots, c.p., £34 15s.

Sodium Iodide. BP, under 1 cwt., per lb., 13s ; 1-cwt. lots, per lb., 12s 9d.

Sodium Metaphosphate [Calgon]. Flaked, paper sacks, £133.

Sodium Metasilicate. (Spot prices) D/d UK in 1-ton lots, 1-cwt. free paper bags, £27 10s.

Sodium Nitrate. Chilean refined gran. over 98%, 6-ton lots, d/d c.p., £29 10s.

Sodium Nitrite. 4-ton lots, £32.

Sodium Perborate. (10%0) in 1-cwt. free kegs, cwt. lots, £145 15s.

Sodium Percarbonate. 12½% available oxygen, in 1-cwt. kegs, £170 15s.

Sodium Phosphate. D/d, ton lots: di-sodium, crystalline, £40 10s, anhydrous, £88; tri-sodium, crystalline, £39 10s, anhydrous, £86.

Sodium Silicate. (Spot prices) 75-84° Tw. Lancs and Ches., 4-ton lots, d/d station in loaned drums, £11 17s 6d; Dorset, Somerset and Devon, per ton extra, £3 17s 6d; Scotland and S. Wales, extra, £3. Elsewhere in England, not Cornwall, extra, £1 12s 6d.

Sodium Sulphate [Desiccated Glauber's Salt]. D/d in bags, about £20.

Sodium Sulphate [Glauber's Salt]. D/d, up to £18 10s

Sodium Sulphate [Salt Cake]. Unground, d/d station in bulk, £10.
MANCHESTER: d/d station, £10 10s.

Sodium Sulphide. Solid, 60/62%, spot, d/d, in drums in 1-ton lots, £36 2s 6d; broken, d/d, in drums in 1-ton lots, £37 2s 6d.

Sodium Sulphite. Anhydrous, £71 10s; comm., d/d station in bags, £27-£28 10s.

Sulphur. 4 tons or more, ground, according to fineness, £20-£22.

Sulphuric Acid. Net, naked at works, 168° Tw. according to quality, £10 0s.-£11 12s 6d; 140° Tw., arsenic free, £8 7s 6d.; 140°Tw., arsenious, £8 2s 6d.

Tartaric Acid. Per cwt.: 10 cwt. or more, £14; 1 cwt., £14 5s.

Titanium Oxide. Standard grade comm., rutile structure, £178 ; standard grade comm., anatase structure, £163.

Zinc Oxide. Max. for 2-ton lots, d/d, white seal, £90 10s; green seal, £88 10s; red seal, £85 10s.

SOLVENTS AND PLASTICISERS

Acetone. All d/d. In 5-gal. drums, £128 in 10-gal. drums, £118; in 40-45-gal. drums, under 1 ton, £93; 1-5 tons, £90; 5-10 tons, £89; 10 tons and up, £88; in 400-gal. tank wagons, £85.

Butyl Acetate BSS. 10-ton lots, £173.

***n*-Butyl Alcohol BSS.** 10 tons, in drums, d/d, £149.

***sec*-Butyl Alcohol.** All d/d. In 5-gal. drums, £168; in 10-gal. drums, £158; in 40-45 gal. drums, under 1 ton, £133; 1-5 tons, £130; 5-10 tons, £129; 10 tons and up, £128; in 400-gal. tank wagons, £125

tert-**Butyl Alcohol.** 5-gal. drums, £195 10s; 40/45-gal. drums: 1 ton, £175 10s; 1-5 tons, £174 10s; 5-10 tons, £173 10s; 10 tons and up, £172 10s.
Diacetone Alcohol. Small lots: 5-gal. drums, £185; 10-gal. drums, £175. 40/45-gal. drums: under 1 ton, £148; 1-5 tons, £147; 5-10 tons, £146; 10 tons and over, £145, in 400 gal. tank wagons; £142.
Dibutyl Phthalate. In drums, 10 tons, d/d, per ton, £220; 45-gal. drums, d/d, per lb., 2s 0½d.
Diethyl Phthalate. In drums, 10 tons, per ton, £187 10s; 45-gal. drums, d/d, per lb., 1s 9d.
Dimethyl Phthalate. In drums, 10 tons, per ton, d/d, £179, 45-gal. drums, d/d, per lb., 1s 8d.
Dioctyl Phthalate. In drums, 10 tons, d/d, per lb., 2s 8d; 45-gal. drums, d/d, per lb., 2s 9½d.
Ether BSS. 1-ton lots, drums extra, per lb., 1s 11d.
Ethyl Acetate. 10-ton lots, d/d, £145.
Ethyl Alcohol [PB 66 o.p.]. Over 300,000 p. gal. 4s 0½d; d/d in tankers, 2,500-10,000 p. gal., per p. gal., 4s 2½d. D/d in 40/45-gal. drums, p.p.g. extra, 1d.
Absolute alcohol (75.2 o.p.), p.p.g. extra, 5d.
Methanol. Pure synthetic, d/d, £43 15s.
Methylated Spirit. Industrial 66° o.p.: 500-gal. and up, d/d in tankers, per gal., 5s 10½d; 100-499 gal. in drums, d/d, per gal., 6s 3d-6s 5d. Pyridinised 66 o.p. : 500 gal. and up, in tankers, d/d, per gal., 6s 2d; 100-499 gal. in drums, d/d, per gal., 6s 6½d-6s 8½d.
Methyl Ethyl Ketone. All d/d. In 5-gal drums, £183; in 10-gal. drums, £173; in 40/45-gal. drums, under 1 ton, £148; 1-5 tons, £145; 5-10 tons, £144; 10 tons and up, £143; in 400-gal. tank wagons, £140.
Methyl *iso*Butyl Carbinol. All d/d. In 5-gal. drums, £203 ; in 10-gal. drums, £193 ; 40-45 gal. drums, less than 1 ton, £168 ; 1-9 tons, £165 ; 10 tons and over, £163 ; in 400-gal. tank wagons, £160.
Methyl *iso*Butyl Ketone. All d/d. In 5-gal. drums, £209; in 10-gal. drums, £199; in 40/45-gal. drums, under 1 ton, £174; 1-5 tons, £171; 5-10 tons, £170; 10 tons and up, £169; in 400-gal. tank wagons, £166.
***iso*Propyl Acetate.** In drums, 10 tons, d/d, £137; 45-gal. drums, d/d, £143.
***so*Propyl Alcohol.** Small lots: 5-gal. drums, £118; 10-gal. drums, £108; 40/45 gal. drums: less than 1 ton, £83; 1-9 tons, £81; 10-50 tons, £80 10s; 50 tons and up, £80.

RUBBER CHEMICALS

Carbon Disulphide. According to quality, £61-£67.
Carbon Black. Per lb., according to packing, 8d-1s.
Carbon Tetrachloride. Ton lots, £83 15s.
India-Rubber Substitutes. White, per lb., 1s 5½d to 1s 8d; dark, d/d, per lb., 1s 1½d-1s 5d.
Lithopone. 30%, about £56 10s.
Mineral Black. £7 10s-£10.
Sulphur Chloride. British, about £50.
Vegetable Lamp Black. 2-ton lots, £64 8s.
Vermilion. Pale or deep, 7-lb. lots, per lb., 15s 6d.

COAL-TAR PRODUCTS

Benzole. Per gal., min. 200 gal., d/d in bulk, 90's, 5s 3d; pure, 5s 7d.
Carbolic Acid. Crystals, min. price, d/d bulk, per lb., 1s 4d; 40/50-gal. ret. drums extra, per lb., ½d. Crude, 60's, per gal., 8s 4d.
MANCHESTER: Crystals, d/d, per lb., 1s 4d-1s 7d; crude, naked, at works, 8s 4d.
Creosote. Home trade, per gal., according to quality, f.o.r. maker's works, 1s-1s 9d. MANCHESTER: Per gal., 1s 2d-1s 8d.
Cresylic Acid. Pale 99/100%, per gal., 6s 6d; 99.5/100%, per gal., 6s 8d. D/d UK in bulk: Pale ADF, per imperial gallon f.o.b. UK, from 7s 8d to 9s 3d; per US gallon, c.i.f. NY, 100 to 118.5 cents freight equalised.
Naphtha. Solvent, 90/160°, per gal., 5s 3d; heavy, 90/190°, for bulk 1,000-gal. lots, d/d, per gal., 3s 11d. Drums extra; higher prices for smaller lots.
Naphthalene. Crude, 4-ton lots, in buyers' bags, nominal, according to m.p.: £19-£30; hot pressed, bulk, ex-works, £40; refined crystals, d/d min. 4-ton lots, £65-£66.
Pitch. Medium, soft, home trade, f.o.r. suppliers' works, £10 10s; export trade, f.o.b. suppliers' port, about £12.
Pyridine. 90/160, per gal., 15s.-17s 6d.
Toluole. Pure, per gal., 5s 3d; 90's, d/d, 2,000 gal. in bulk, per gal., 5s.
MANCHESTER: Pure, naked, per gal., 5s 6d.
Xylole. According to grade, in 1,000-gal. lots, d/d London area in bulk, per gal., 6s 2d-6s 6d.

INTERMEDIATES AND DYES

(Prices Nominal)

m-**Cresol** 98/100%. 10 cwt. lots d/d, per lb., 4s 9d.
o-**Cresol** 30/31°C. D/d, per lb., 1s.
p-**Cresol** 34/35°C. 10 cwt. lots d/d, per lb., 5s.
Dichloraniline. Per lb., 4s 6d.
Dinitrobenzene. 88/99°C., per lb., 2s 1d.
Dinitrotoluene. Drums extra. SP 15°C., per lb., 2s 1½d; SP 26°C., per lb., 1s 5d; SP 33°C., per lb., 1s 2½d; SP 66/68°C., per lb., 2s 1d.
p-**Nitraniline.** Per lb., 5s 1d.
Nitrobenzene. Spot, 90 gal. drums (drums extra), 1-ton lots d/d, per lb., 10d.
Nitronaphthalene. Per lb., 2s 5½d.
o-**Toluidine.** 8-10-cwt. drums (drums extra), per lb., 1s 11d.
p-**Toluidine.** In casks, per lb., 6s 1d.
Dimethylaniline. Drums extra, c.p., per lb., 3s 5d.

Market Reports

Lack of Demand Does Not Affect Prices

LONDON Buying on home account has again been limited to immediate needs and most sections of the industrial chemicals market report a continuation of quiet conditions. The absence of any pressure in demand has not affected prices, and quotations generally are on a firm basis. Zinc oxide prices have recovered their recent fall with the rise in the price of the metal, and the Red Seal is currently quoted at £87 per ton for 2 ton lots. Enquiries for shipment have been fairly numerous and the actual movement on export account is keeping up to a satisfactory level. There has been no outstanding feature on the coal-tar products market, and both prices and business remain steady.

MANCHESTER Middle East events seem to have had little influence on trading conditions on the Manchester market for heavy chemical products during the past week. On the other hand, holiday stoppages at the consuming end continue to leave their mark on contract deliveries, as well as on the volume of new business. The demand for textile bleaching, dyeing and finishing chemicals is relatively quiet, but in most other directions deliveries are on a fair scale after due allowance has been made for the seasonal influence. In several sections of the fertiliser trade a reasonable weight of forward business has been reported.

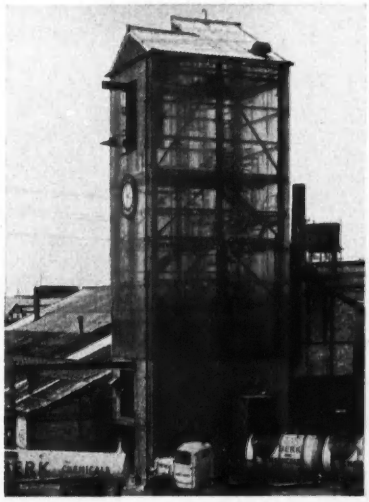
GLASGOW Although business has been reasonably active during the past week in the Scottish heavy chemical market, a slight falling off, as was expected, has been experienced towards the end of the week, due to the approaching Glasgow Fair holidays. Prices in the majority of cases have remained firm. In regard to agricultural chemicals, there is still considerable activity in keeping with seasonal demands, while the position in the export market remains more or less unchanged.

Permali Install Large PTFE Sinter Oven

RECENTLY installed by Permali Ltd., Gloucester, is a sintering oven 6 ft. by 6 ft. by 15 ft. long, one of the largest in the country. It is the latest of four ovens now working in the PTFE department and means that much larger articles such as tanks, rollers and containers, can be accepted for dispersion coating. The oven is, however, also being used for sintering solid PTFE.

During operation, carefully controlled operating temperatures of around 400°C are required and these are obtained by continually circulating hot air which has previously been heated by means of gas.

Berk Plant Sheathed in Rigid Vinyl



This 65-ft. tower with steel angle frame and outer sheath of Cobex (rigid vinyl) houses a difficult remote-controlled process at the works of F. W. Berk Ltd., London E15. The sheeting, manufactured by BX Plastics Ltd., is corrugated and of an amber colour. The tower was erected to the design of Berk engineers

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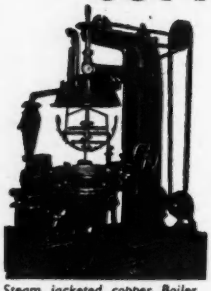

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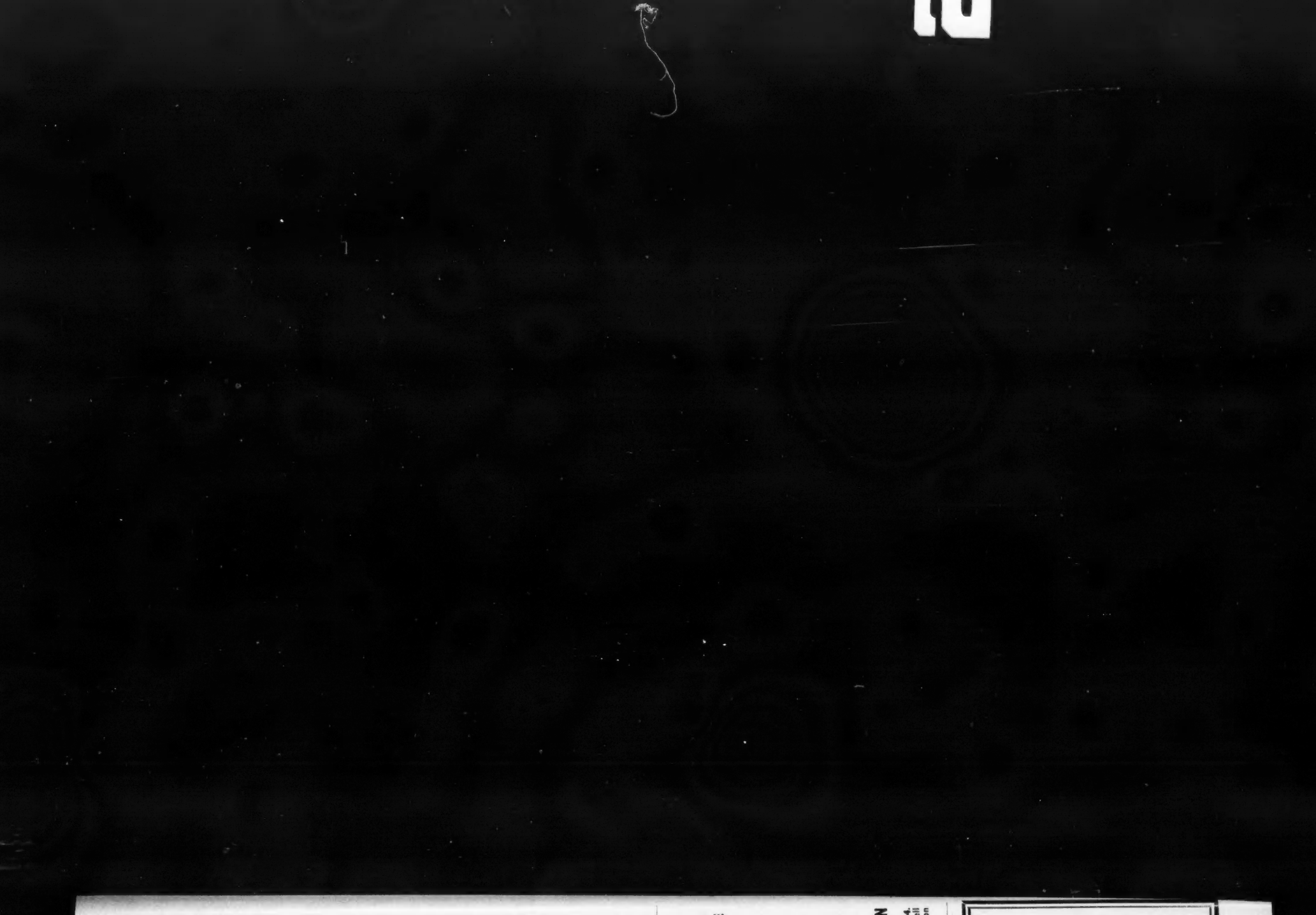
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